1.CLIMATE RESILIENT GREEN ECONOMY: PROSPECTS

Dr.R.RAGAPRIYA, I.A.S.,Managing Director, Gulbarga Electric Supply Company, Government of Karnataka.

Prof.D.RUDRAPPAN, President, AMECA, Former Joint Director of Collegiate Education, Govt. of Tamil Nadu, Professor, Department of Development Economics, Ethiopian Civil Service University, Ethiopia.

"The size and extent of the climate change threats are new. It is arguably the biggest challenge humanity faces today. This means that we must act urgently and seize opportunities quickly. One such opportunity is renewable energy," – President of the 72nd UN General Assembly.

ABSTRACT

A new political climate has grown in many countries around the world, thanks to the strong base in science and widening public awareness of climate change and its risks. Clean energy revolution has been taking place all over the developed countries, underscored by the steady expansion of the renewable energy sector. The adoption of Renewable Energy Technologies (RETs) constituted a win-win situation, as renewable is not only green and job-generating, but also sustainable with a higher environmental benefit. Renewable fuels such as wind, solar, biomass, tides, and geothermal are inexhaustible, indigenous and are often free as a resource. They just need to be captured efficiently and transformed into electricity, hydrogen or clean transportation fuels. The renewable energy sources have hardly any carbon footprint and are environment-friendly and do not require environmentally-damaging mining and transport. The paper highlights various sources of clean energy in the context of sustainable economic, environmental, and social development besides focusing on the importance of renewable energy in the modern world.

INTRODUCTION

The prevailing economic growth model is focused on increasing GDP above all other goals. While this economic system has improved income and reduced poverty for hundreds of millions, it comes with significant jobless growth and potentially irreversible social, environmental and economic costs (Rudrappan, 2004). Poverty persists for as many as 2.5 billion people even today; the natural wealth of the planet is rapidly being drawn down. World Bank has estimated that approximately 60 percent of the world's ecosystem services were found to be degraded or used unsustainably. The gap between the rich and poor has also been increasing-between 1990 and 2005, income disparity (measured by the gap between the highest and lowest income earners) rose in more than two-thirds of countries.

The persistence of poverty and degradation of the environment can be traced to a series of market and institutional failures that make the prevailing economic theory far less effective than it otherwise would be in advancing sustainable development ambitions. These market and institutional failures are well known to economists, but little progress has been made to address them. For example, there are not sufficient mechanisms to ensure that polluters pay the full cost of their pollution. Likewise, there are "missing markets" – meaning that markets do not systematically account for the inherent value of services provided by nature, like water filtration or coastal protection. A "market economy" alone cannot provide public goods, like efficient electricity grids, sanitation or public transportation. And economic policy is often shaped by those who wield power, with strong vested interests and rarely captures the voice and perspectives of those most at risk. Environmental devastations and climate challenges take place as a result of present-day non-suitable economic policies based on non-renewable energy which makes it clear the need to change the present economic model.

Energy, though consisting of positive and negative features, is a vital basis of livelihood. Despite the fact that non-renewable energy is cheaper and easier to produce, the reserves of fossil fuels would be exhausted soon. Therefore, importance need to be given to green energy sources which are non-polluting, dependable and labor intensive which will propel the economy to a stronger and a higher level. The latest one among clean energy sources is fuel cells. They offer a highly efficient and fuel flexible technology that produces power with zero emission. Moreover, hydrogen fuel cells emit water only

with no CO2 emissions and air pollutants that create haze and cause health complications as in the case of fossil fuels. Hence, the paper explores how to achieve climate compatible development path through green energy sources with the objectives listed below.

OBJECTIVES

The objectives of the paper have been listed below

To find out sources of clean energy, importance, and impact on the economy; and

To suggest remedial measures for raising the contribution of green energy and for efficient use of renewable energy sources..

Methodology

Descriptive study is adopted and secondary sources of information were collated and used for the present study.

GREEN ECONOMY INITIATIVES OF UNEP

Energy is deposited in a range of energy sources, which can be described as non-renewable or renewable. Renewable sources of energy are those that can be refilled in a short period of time, as opposed to non-renewable sources of energy. Renewable fuels such as wind, solar, biomass, tides, and geothermal are inexhaustible, indigenous and are often free as a resource. The use of renewable sources of energy is less polluting, compared to that of non-renewable sources. Specifically, increased dependence on renewable sources of energy is a key element of efforts to avert climate change. Renewable sources of energy today make a small contribution to total energy use, compared to that of non-renewable sources. A range of barriers including the high cost of production hampers the widespread deployment of renewable energy technologies. Green Economy attempts to remedy these problems through a variety of institutional reforms and regulatory measures, tax, and expenditure-based economic policies and tools. The concept of green economy has been strongly recommended by the United Nations Conference on Sustainable Development held in Rio in 2012.

ELEMENTS OF SUSTAINABLE DEVELOPMENT ARE ENVIRONMENT, SOCIETY, AND ECONOMY

A key feature of the sustainable development is that it comprises three elements: Environment, Society, and Economy. Or, the three Ps: Planet, People, and Profit. All the three, in no particular order, are balanced so that one doesn't destroy another. The greater sustainability movement, however, is guided by these three E's, commonly referred to as the "three pillars" of sustainability: environment, equity, and economics. The environmental pillar is the most talked-about aspect of sustainability along with economic efficiency. Economic efficiency implies an economic state in which every resource is optimally allocated to serve each individual or entity in the best way while minimizing waste and inefficiency. When an economy is economically efficient, any changes made to assist one entity would harm another.

MAJOR CAUSES OF GLOBAL CLIMATE CHANGE

Global climate changes seen above have occurred as a result of an increase in greenhouse gases, aerosols and land use changes in the context of urbanization wave witnessed in the world. Global warming is caused mainly by three factors such as radiation from the sun, earth's natural temperature cycle as a result of changes in earth magnetic field and the accumulation of carbon dioxide (C02) in the atmosphere. Climate change refers to an increase in average temperature on account of a rise in the emission of greenhouse gases; while emission of carbon dioxide is weighed in tonnes and gigatonnes (Gt=109 tonnes), green house gas concentration in the atmosphere is monitored in parts per million (ppm) molecules of dry air. In the baseline scenario i.e., business as usual scenario, the CO2 concentration would rise from 27 Gt in 2005 to 62 Gt in the year 2050, corresponding to an increase from 379 ppm to 550 ppm of CO2 in the same period as against the natural range of 180 ppm to 330 ppm. (Aswathanarayana,2010). Similarly the atmospheric concentration of methane gas has increased from 775 parts per billion (ppb) molecules of dry air in the 1990s to 1732 ppb in 2005 as against the normal range of methane between 320 ppb and 790 ppb. (IPCC, 2007) This phenomenon of global warming takes place in the atmosphere between earth surface and the ozone layer which is about 50 km up in the atmosphere ((Nakicenovic, 2001). Further, it is pointed out that temperature tends to decline with distance from the surface of the earth.

To avert the catastrophes of global warming, green economy is needed because it is low carbon, resource efficient, and socially inclusive, focusing on sustainable development and poverty reduction. The green economy is defined as an economy that aims at reducing environmental risks and ecological scarcities, and that aims for equity and sustainable development without degrading the environment. To implement this concept, the United Nations Environment Programme (UNEP)'s Green Economy Initiative (GEI) has been designed to assist governments in "greening" their economies by reshaping and

refocusing policies, investments and spending towards a range of sectors, such as clean technologies, and renewable energies. Ban Ki-moon, Secretary General of UN has rightly said '' the clear and present danger of climate change means we cannot burn our way to prosperity. We already rely heavily on fossil fuels. We need to find a new, sustainable path to the future we want. We need a clean industrial revolution''.

Thus, as seen above, while the prevailing economic growth model focuses on increasing GDP above all other goals, a Green Economy promotes a triple bottom line: sustaining and advancing economic, environmental and social well-being. The energy sector is accountable for about 25 percent of worldwide greenhouse gas emissions. Improving energy effectiveness and raising the share of renewable power in the global energy mix is significant to reducing carbon dioxide emissions and achieving the central goal of the Paris Climate Change Agreement, 2017 which has stipulated to limit the global average temperature rise to well below two degrees and as close as possible to 1.5 degrees Celsius above the pre-industrial levels.

A low-carbon economy (LCE), low-fossil-fuel economy (LFFE), or a decarbonized economy is an economy based on low carbon power sources and therefore has a minimal output of greenhouse gas (GHG) emissions into the biosphere, but specifically refers to the greenhouse gas carbon dioxide. Implementing green economy practices can help reduce waste, conserve natural resources, improve both air and water quality, and protect ecosystems biodiversity and usher in sustainability. Sustainability broadly means balancing economic, social and environmental systems so that one 'system' does not adversely impact the other two. Long term changes in the average weather patterns / temperature has been often used interchangeably with 'Global Warming "or "Green House Gas Effect" phrases and have been linked to manmade acceleration of the quantity of CO2 produced globally. Going green helps the environment by reducing the amount of pollution that enters the soil, water, and air. By using alternative energy sources and avoiding the burning of fossil fuels, recycling and reducing waste and driving more efficiently, fewer pollutants are released into the environment in order to protect planet, Earth (Rudrappan, 2010).

TRANSITION TO A GREEN ECONOMY

The transition to a Green Economy has a long way to go, but several countries are demonstrating leadership by adopting national "green growth" or "low carbon" economic strategies. And there are many examples of successful, large-scale programs that increase growth or productivity and do so in a sustainable manner such as in the case of Republic of Korea and China. In many ways, Green Economy objectives simply support those already articulated for the broader goal of sustainable development. But this new framing responds to following two recent developments.

First, there is a deeper appreciation today by many governments, corporate bodies, and the civil society that we are reaching planetary limits, not just in terms of greenhouse gas emissions but also in our use of water, land, forests and other natural resources. The environmental and social costs of our current unviable economic model are becoming more and more apparent. Already, the Club of Rome has cautioned the world governments about the dangers of crossing the limits to growth way back in 1972 through its publication Limits to Growth. Efforts of economists have not been focused so far on fixing the failures of economics in addressing these problems so far.

Second, and perhaps even more important, the global recession has led to a reconsideration of key tenets of the current economic model– such as the primacy of growth and the belief in light-touch regulation. Many leaders in the public and private sector have questioned the existing economic policies and seek:

- Policies and regulations that can identify and manage financial and other risks more effectively
- New markets and industries that can create good and long-term jobs
- Public support for innovation to position a country to compete in tomorrow's international markets

These developments point to the need for a new source of growth that is environmentally sustainable–for example, employment in high-growth sectors such as clean energy. Past sustainability efforts have not focused sufficiently on fixing the failures of economic policies such as pricing the problem of pollution. But now, the policy makers have a chance to tackle these challenging problems, given the policy openings created by the response to the global financial crisis. A good example is Republic of Korea's adoption of a national green growth strategy.

However, in the wake of global financial problems, people have their own doubt about the affordability of green economy solutions which are perceived to be expensive. The USA as well as most other developing countries are much concerned that transitioning to a Green Economy will hinder economic growth and the

ability to reduce poverty. Moreover, there will be short-term, non-trivial losses associated with the changes in industry and market structure (e.g., a decline of the coal industry and related job losses.) Supporting those actors who will bear the brunt of the transition to the green energy will be critical for building a Green Economy.

Some countries feel that they are lagging behind in green technology know-how and its implementation and therefore will be at a competitive disadvantage in the race for future markets. Others feel that the Green Economy is the pretence for rich countries to erect "green" trade barriers on the exports of developing countries.. These are all legitimate concerns that deserve attention and solution by the developed countries.

Finally, economic analysts should inform policy decision makers on what policies and investments should be promoted. When the full costs and benefits over time are taken into account, many Green Economy solutions will be seen as more attractive. Nevertheless, there will still be difficult choices and trade-offs. Is it reasonable to promote and invest in expensive, grid connected solar power, when hundreds of millions in India still have no access to electricity in remote villages? And even where Green Economy solutions make economic sense, they may be politically challenging. The transition to a Green Economy will not be that easy. The principal challenge is how to move towards an economic system that will benefit more people over the long run. Transitioning to a Green Economy will require a fundamental shift in thinking about growth and development, production of goods and services, and consumer habits. This transition will not happen solely because of better information on impacts, risks or good economic analysis; ultimately, it is based upon the decision of policy makers at the top. Moreover, the problem is vested interests. Those who benefits from the status quo are either over represented or have greater access to institutions that manage natural resources and protect the environment. U.S. climate legislation, for example, was defeated in no small part by resistance from fossil-fuel based energy advocates.

The following steps would help to formulate decisions in favour of green energy solutions.

•Increase public awareness and the case for change. Greater visibility on the need for this transition can motivate voters and consumers - not just because of the costs but also the economic benefits generated by a Green Economy, such as new job generation and new markets. People will not adopt policies because they are green. They will do so when they believe it is in their interest in the long run (Rudrappan, 2011).

•Promote new indicators that complement GDP: Planning agencies and finance ministries should adopt a more diverse and representative set of economic indicators that focus less exclusively on growth and track the composition, pace, and progress of development.

•Open up government decision-making processes to the public and civil society so as to ensure policies are accountable to the public and not to vested and well-connected interests.

Timing is everything and important when it comes to big policy reforms. Green Economy advocates will need to be ready when that window of opportunity presents itself.

Ultimately, the widespread transition to a Green Economy will depend on whether or not the long-term public interest is reflected in today's economic policies.

RENEWABLE ENERGY SOURCES

"Green energy'' is a term used to describe the energy that is generated from the sources that are known to be non-polluting. For these reasons, "green'' energy should be considered as the energy of the future. Most are related to the sun in some way. Sunlight produces solar energy directly. It indirectly produces hydropower (through the movement of rainwater), biomass (through photosynthesis) and tidal power (through tides caused by moon and sun). It is estimated that the share of total renewable sources in the world primary energy supply in the year 2005 was 12.7%, the share of coal 25.3%, oil 35.0% and natural gas 20.6% and hydro 2.6%.

Algae can also be used productively to produce not only several kinds of fuel end products but also by-products which have wide-ranging applications in chemical and pharmaceutical industries. They can be mass produced using land and water which are unsuitable for raising plant and food crops. They are energy-efficient and consume carbon dioxide; thereby reducing the level of global warming considerably.

"Bloom Box'', recently unveiled by K.R. Sridhar, an Indian American has the potential to revolutionize electricity production. It is a fuel cell device consisting of a stack of ceramic disks coated with secret green and black "inks''. It can convert any renewable and fossil fuel such as natural gas, biogas, coal, and gas into electricity round the clock. Since no combustion is involved, there would be no noise, smell or emissions. (Fells, 1990)

Renewable technology favors decentralization and more importantly attempts to seek local solutions to local problems, independent of the

national network. This process enhances the flexibility of the system thereby spreading the economic benefits to the scattered population, who are often small in number. Several studies have pointed out that seventy-five percent of the world's energy supply is used by only 25 percent of the people living in wealthy and industrialized economies. (OECD, 1995) However, it is usually the under-developed or developing countries that face the maximum risk from climate-related threats. Therefore, the investment in green energy supply and progress should be encouraged by governments of all countries and other authorities for green energy replacement of fossil fuels which are far more environmentally benign for a sustainable future. One of the initiatives that gained political support from various countries at the Copenhagen Summit (2009) was the Reduced Emissions from Deforestation and Forest Degradation (REDD) programme. REDD involves supporting developing countries financially to conserve rather than clear tropical forests. Twenty-five years ago, methanol was vigorously promoted. Then came the phase of electric vehicles, the hybrid-electrics, the fuel cells, and the ethanol and finally to plug-in hybrids today.

In December 2015, representatives of 196 governments have met in Paris on the need to limit to global warming to 1.50 c above the pre-industrial levels, a good goal that holds the promise of delivering transformational change, if the aim is translated into action. Due to political challenges from some countries on the need to control co2, some have suggested to focusing on the need to develop large-scale technological interventions to control the global thermostat. Advocates of geo-engineering technologies put forth that conventional adaptation and mitigation measures are not reducing emissions fast enough to prevent alarming warming. "carbon capture and storage" (CCS) technology is needed to suck the excess carbon dioxide out of the atmosphere and to limit global warming and human sufferings as per the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. CCS is a process of capturing waste co2 from huge sources like fossil-fuel based power plants and depositing it in an underground geological formation, leading to prevention of co2 from entering into the atmosphere. However, the problem is depositing co2 in an underground formation also enables increased oil recovery, thereby leading to a more co2 formation in the near future.

Another technology, bio-energy with carbon capture and storage (BECCS) is the process of planting fast-growing trees which naturally capture co2. After some time, these plants have been converted into fuel via burning for power plants and the resulting carbon emissions are captured and sequestered. However, the demand for biomass has led to land grabs and rising food commodity prices.

The third proposal related to geo-engineering is known as Solar Radiation Management (SRM) which aims to control the sun light from reaching Earth. SRM may be achieved by pumping sulphates into the stratosphere which would cause clouds to reflect more sunlight back into space. It merely delays the impact and not reduces co2 concentrations; hence scientists do not favor SRM as it changes climatic conditions such as drought and flood in some areas damaging the livelihoods of millions of people.

Besides the above climate control technologies, there are simple and politically challenging methods such as a moratorium on new coal mines and new coal-power plants. The investments in coal-fired plants could be diverted to decentralized renewable energy production. A mere 10 percent of the global population in developed countries is responsible for almost 50 percent global co2 emissions.

The fifth powerful measure would be to protect and restore natural ecosystems such as wetlands which would result in the storage of 220-330 gigatons of co2 all over the world. Other remedial measures for reducing co2 include strengthening public transportation, encouraging the use of railways for freight traffic, building bike paths and subsidizing delivery of bicycles.

All the above solutions put together could change the world for better but none of the above solutions is a silver bullet. As world leaders convene for the 22nd United Nations Framework Convention on climate change to bring the Paris Agreement into force, the planetary thermostat should be under the control of all the nations and not a handful of powerful states.

GLOBAL CLIMATE CHANGE

As a result of radioactive forcing, climates have been subjected to global changes like all other planetary surfaces. The components of global climate system such as atmosphere, biosphere, hydrosphere, cryosphere, and lithosphere interact with each other to determine Earth's climate. Moreover, the climate is influenced by the long-term balance between incoming solar or "short-wave" radiation and outgoing terrestrial "long-wave" radiation. The changes

in climate have been documented by the Intergovernmental Panel on Climate Change (IPCC). Main findings as summarized in Horton et al.,(2010) have been listed below:

→ global warming temperatures have been due to human activities (IPCC, 2007);

→ carbon dioxide (co2) have been found to be more than one-third higher than pre-industrial levels;

→ other gases such as methane (CH4) has increased by 100% and nitrous oxide (N2O) has risen by 20 % over the above period;

→ subsequent increases in greenhouse gas concentrations are projected to lead to higher level of temperatures and climate changes;

→ in this 21st century, the global average temperature is expected to raise between 1.8 and 4.00 c

By 2100, warming has been expected to increase by more than 8.0C over land, northern hemisphere, and Arctic region. Precipitation has been expected to increase in high altitude cities and decrease in sub-tropical cities. Ocean acidification will increase due to the absorption of CO2 by oceans which would lead to large implications on the marine ecosystem. In coastal cities, marine ecosystem provides livelihood and sustenance to billions of people and this would be affected by ocean acidification.

CONCLUSION

Thus, green energy is more labor-intensive than fossil fuel, creates more jobs benefiting poor countries. It diversifies energy supply, reducing nation's dependence on foreign oil. Pollution reduction improves public health as well as lowers health cost. Not only, it provides individual energy independence, but also saves a lot of money for the country. After the construction of renewable energy power source, one can draw it free of cost since the input is free. Green energy has less service disruption and can take the economy to a stronger level through the ripple effect that benefits other related industries. In view of the above, it is reemphasized once again that climate change, social equity, and sustainable economic development are compatible if the country uses green energy sources. To conclude '' we have a choice: between energy-efficient low carbon path and an energy-intensive high carbon path, which at an unknown point of time ends catastrophically. This doesn't seem like a very hard choice'' –Michael Spence, Professor of Economics, NYU Stern School, Italy.

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2. CLIMATE AND ENVIRONMENTAL CHANGES: RESTROSPECT AND PROSPECT

Dr.PRADEEP PRAJAPATI, Professor, Department of Economics, Gujarat University,Ahmedabad.

ABSTRACT

Discussion on problems of climate and environmental changes i.e. global warming has inundated in recent years. Every major newspaper publishes multiple editorials or op-ed pieces on the topic, the broadcast media and researchers regularly discuss the issue, and thousands of Web pages and blogs provide definitions and information and suggest causes and consequences of action and inaction. Under the situation why are we adding to congestion on the subject?

Because the analysis of past has much to contribute, especially in understanding prospects of adapting to climate change, which has received relatively little study and comment relative to the standing it should take in the debate [Gary D. Libecap and Rechard H. Steckel, 2011].

At the outset, it is to be noted that in the present paper science of climate change is not evaluated as author is not the expertise to contribute on this matter but the paper respond to economic effects of the climate and environmental changes.

INTRODUCTION

Climate change, an environmental problem was exposed by scientists and explore by economists in relation to its far reaching economic consequences. It was realizing after penetrate studies that humanities is at peril with rapidly growing world economy with excessive exploitation of natural resources and nature itself. The resultant effects were realized by human being and non-human beings and it turned out to be threat to planet's finite resources and the consumption.

In 1972, UN conference on Human Environment in Stockholm, serious thought was given and it was warned that the community of senseless growth would result into drastic economic and political consequences. Moreover it was realized in the conference that humanity would be at peril in the sense that scarcity of minerals and ores would make it difficult to maintain the level of economic activity for sustainable development.

The climate change is a serious environmental problem for it distort the functioning of Earth's ecosystem, the biodiversity and the ability of the atmosphere to absorb green house gases (GHGs) emitted by humanity from fossil fuels and other agricultural and industrial processes. It must be noted that these threats are human-induced climate change, resulting from the building of GHGs including carbon dioxide, methane, nitrous oxide and some other industrial chemicals.

The scientific process of climate change explains that earth's energy balance is strucked. The imbalance of energy in planet is caused by several gasses like GHGs: Carbon Dioxide (CO2), Methane (CH4), Nitrous Oxide (N2O and industrial chemicals called as Hydro Fluorocarbons (HFC's), Per Fluorocarbons (PFC's) and Sulphur hexafluoride (SF6). Another major GHG is water vapour (H2O), which, like CO2, traps infrared radiation and thereby warns the planet. The first kind of GHGs (CO2, CH4, N2O and HFCs) is all directly emitted by human activity. Water is only indirectly affected by human activity. As per planet warms, the water vapour in the atmosphere tends to increase, and this increase causes an additional greenhouse effect, meaning an additional rise in temperature.

The built-up GHGs destroy our food crops and farm system, locations of plants and animals, the location of cities, key infrastructure, and public health. In brief a fairly stable temperature of earth becomes unstable.

It is predicted that the temperature increase by the end of the century compared with the pre industrial average temperature could be as much as 4-7o C and this would be very likely to have devasting effects in many ways. Precisely it includes food, water, ecosystem, extreme weather events, and major irreversible changes to earth's physical system.

ENVIRONMENTAL EFFECTS

The inherent variability of regional climates in the past and projections of the future suggest that climate change poses serious and potentially dramatic challenges to the any economy. In part, the magnitude of these challenges depends upon the nature of the overall weather response to the build-up of Green House Gases (GHG). The economic impact of which depends on the time frame under which climate changes occur. As with temperature projections, there is no consensus on a specific time period for major economic damages to materialise. One possibility is that they are small and isolated for twenty to fifty years, after which they are cumulatively larger. If this is correct, then may make sense

for modest emissions abatement programs initially while the economy begins to adjust, more technology and learning are developed, and more information is generated [National Academy of Sciences, 2008, Nordhaus, 2008 and Kousky, Rostapshove, et. al., 2009].

Temperature:

A sustained wet-bulb temperature exceeding 35° is a threshold at which the resilience of human systems is no longer able to adequately cool the skin. A study by NOAA from 2013 concluded that heat stress will reduce labor capacity considerably under current emissions scenarios [John P. Dunne; Ronald J. Stouffer; Jasmin G. John, 2013]. There is evidence to show that high temperatures can increase mortality rates among foetuses and children. And the health impacts and risks of higher temperatures also reduce learning and worker productivity, which can impact a country's economy and development.

Water:

The freshwater resources that humans rely on are highly sensitive to variations in weather and climate. In 2007, the IPCC reported with high confidence that climate change has a net negative impact on water resources and freshwater ecosystems in all regions. The IPCC also found with very high confidence that arid and semi-arid areas are particularly exposed to freshwater impacts.

As the climate warms, it changes the nature of global rainfall, evaporation, snow, stream flow and other factors that affect water supply and quality. Specific impacts include:

- Warmer water temperatures affect water quality and accelerate water pollution.
- Sea level rise is projected to increase salt-water intrusion into groundwater in some regions. This reduces the amount of freshwater available for drinking and farming.
- In some areas, shrinking glaciers and snow deposits threaten the water supply. Areas that depend on melted water runoff will likely see that runoff depleted, with less flow in the late summer and spring peaks occurring earlier. This can affect the ability to irrigate crops.
- Increased extreme weather means more water falls on hardened ground unable to absorb it, leading to flash floods instead of a replenishment of soil moisture or groundwater levels.
- Increased evaporation will reduce the effectiveness of reservoirs.
- At the same time, human demand for water will grow for the purposes of cooling and hydration.

Under these facts a major question, then, is how adaptable is the economy?

- Agriculture would be particularly vulnerable if temperature and precipitation become more erratic with larger swings.
- Electricity demand and pressure on utilities also likely would increase.
- Human beings/Health would be affected;

And, ultimately,

- Growth rate of GDP would be affected.

EFFECTS ON AGRICULTURE IN INDIA

In India, average food consumption at present is 550 g per capita per day, whereas in China and USA are 980 and 2850 g, respectively. The country faces major challenges to increase its food production to the tune of 300 mt by 2020 in order to feed its ever-growing population which is likely to reach 1.30 billion by the year 2020. To meet the demand for food from this increased population, the country's farmers need to produce 50% more grain by 2020. The total gross irrigated area has more than quadrupled from 22.6 million ha in 1950–51 to 99.1 million ha in 2011-2012. Although, agriculture contributes 14% in the Gross Domestic Product (GDP) in India, 64% of the population depends on agriculture for their livelihood. Over the years, demand for water has increased due to urbanization, increasing population, rapid industrialization and other developmental initiatives. In addition, changes in cropping and land-use patterns, over-exploitation of groundwater and changes in irrigation and drainage have modified the hydrologic cycle in many climate regions and river basins of India. Availability of water is the most important factor in agricultural production. Water quality and quantity are serious constraints for agriculture in most parts of India. Agriculture must adapt to changing climatic conditions by tapping water resources and developing improved water management approaches. Simultaneously, there is also need to develop and implement technologies and policies which will help in reducing and mitigating greenhouse gas emissions. Therefore, assessment of the availability of water resources is future national requirement and expected impact of climate change and its variability is critical for relevant national and regional long-term development strategies for sustainable development [Rohitashw Kumar and Harender Raj Gautam, 2014].

India is home to 16% of the world population, but only 4% of the world water resources. Agriculture is directly dependent on climate, since temperature, sunlight and water are the main drivers of crop growth. While some aspects of climate change such as longer growing season and warmer temperatures may

bring benefits in crop growth and yield, there will also be a range of adverse impacts due to reduced water availability and more frequent extreme weather conditions. These impacts may put agricultural activities at significant risk. Climate change has already caused significant damage to our present crop profile and threatens to bring even more serious consequences in the future (WHO, 1992). Wheat yields are predicted to fall by 5-10% with every increase of 1°C and overall crop yields could decrease up to 30% in South Asia by the mid-21st century. India could experience a 40% decline in agricultural productivity by the 2080s. Rise in temperatures will affect wheat growing regions, placing hundreds of millions of people at the brink of chronic hunger.

According to Subhojit Goswami, 2017, climate change has about 4-9 per cent impact on agriculture each year. As agriculture contributes 15 per cent to India's GDP, climate change presumably causes about 1.5 per cent loss in GDP.

Overall impacts on agriculture are [VUM Rao, 2012];

- Negative impact on rice, wheat and horticulture
- Neutral or positive on some crops like soybean, groundnut, coconut, potato in some zones
- Impact on livestock and fisheries still to be better understood
- Short term impacts in 10-15 years (in the range of 4- 6%) but long term impacts could be as high as 25%
- Short term impacts can be addressed through better deployment of existing g technologies backed by few policy initiatives while long term impacts require strategic research on a long term and a major policy changes

Climate change may dramatically impact habitat loss, for example, arid conditions may cause the deforestation of rainforests, as has occurred in the past [Sahney, S., Benton, M.J. & Falcon-Lang, H.J., 2010].

Food Insufficiency in the World and in India too, is a major challenge [Pradeep Prajapati, 2017]: Already there is a very serious problem of food insufficiency in the world including India, leading to MAL-NEUTRITION because of insufficient production of Cereals and Pulses which provide Calories and Protein accordingly. This has happened because growth rate of output of agriculture is not stable in India and agricultural productivity was also very low. The higher growth rate is not achieved by technical change – seeds, water economization and soil reclamation – in agriculture.

And when productivity is going to be decline further because of climate change it is high time to re-think on Land Reforms – i.e. ownership of land so as to increase agricultural productivity and accordingly to have higher growth rate.

EFFECTS ON ELECTRICITY DEMAND AND PRESSURE ON UTILITIES IN INDIA

There is a positive relationship between temperature and electricity demand over the year as the electricity demand is positively related to temperatures in summer and negatively related to temperatures in winter. Therefore, climate change is expected to reduce electricity consumption in winter and increase electricity consumption in the summer. Also, climate change will affect electricity demand by changing how people will respond along both intensive and extensive margins of adjustment. For instance, in the short run, during summer, people may adapt by using existing cooling equipment more intensively on a hot day while, in the long run, they may choose to buy an air conditioner to mitigate expected reduction in comfort due to changed climate. Thus, while the long-term climate will determine the stock of equipment in different regions, the daily weather or temperature determines the utilisation of the equipment for heating or cooling.

To capture both intensive and extensive adjustments due to climate change, Eshita Gupta (2012, 2014) estimated the impact of daily weather as well as of long-term climate on electricity demand for 28 Indian states during the period 2005-2009 and found that a 1°C increase in temperature in summer increases expected daily electricity demand by 1.5% (as a result of greater usage of cooling equipment) while a 1°C increase in temperature in winter reduces electricity demand by about 0.2% (due to lower usage of heating equipment) at the sample average of income and climate. An increase in temperature in summer has an impact on electricity consumption which is seven times the size of the impact of an equivalent increase in temperature on electricity consumption in winter.

She also found that the interaction of income with the construct cooling degree Index (CDDI) and construct cooling degree days CDDs in summer has a much higher impact on electricity demand than the interaction of income with the heating degree day Index (HDDI) and heating degree days (HDDs) in winter. As income determines how people adapt to climate change, both global warming and income growth will have asymmetric

effects on electricity consumption in summer and winter.

In short, while population and income growth have accounted for most of the electricity consumption growth in India, global climate change is expected to further add to it as people will adapt by buying energy-intensive equipment such as air conditioners and air coolers.

Income growth influences climate sensitivity of electricity demand

She also found that the climate sensitivity of electricity demand in India is likely to be significantly influenced by income growth. Between 2009 and 2030, India´s GDP will double if it grows at 4% per year, and treble if it grows at 6% per year. In a reference scenario with no climate change, electricity demand in India is expected to surge by 105% with 4% GDP growth and by 224% with 6% GDP growth by 2030. If average temperatures in India increase by 1°C during this period, then the demand for electricity is likely to increase by 119% with 4% GDP growth per year, and by 252% with 6% GDP growth per year, by 2030. Thus, as a result of climate change, electricity demand is estimated to be 6.9% higher than in the reference scenario with 4% GDP growth per year and 8.6% higher than in the reference scenario with 6% GDP growth per year, by 2030. This reflects the fact that the estimated marginal effect of hotter climate is greater when incomes are higher.

Over 50% of the impact of climate change on electricity demand is due to extensive adjustments in cooling and heating requirements. Thus, electricity demand models that do not account for extensive adjustments are likely to underestimate the impact of climate change on electricity demand. This is particularly true for developing countries such as India where, unlike developed countries, the penetration of cooling/ heating technologies is very low at present. In a warmer and richer economy in the future, there is bound to be rapid adoption of energy-using equipment in India. This particularly highlights the importance of potential interactions between increasing CDDs days and increasing incomes, and the impact of the resulting long-term adjustments (such as the higher penetration of air cooling devices) on the electricity sector.

Overall, research in economic history reveals both how closely twined are climate, weather, and the economy and how remarkably resilient and adaptive is economy.

This is a valuable insight both because it suggests adjustments are likely to occur as new information, new learning, and new technologies emerge and because it augments contemporary climate change studies that typically rely upon either simulations or very limited data sets. Adaptation takes time, and history is the best provider of information about how it has unfolded over time.

Any economic analyses of climate change focus of a relationship that translates changes in temperature (and possibly changes in precipitation and other climate-related variables) to economic losses. Economic losses, would of course, include losses of Gross Domestic Product (GDP) and consumption that might result from reduced agricultural productivity or from dislocations resulting from higher sea levels but also the monetary-equivalent costs of possible climate-related increases in morbidity, mortality, and social disruption.

ENERGY SECTOR

a) Oil, coal and natural gas:

Oil and natural gas infrastructure is vulnerable to the effects of climate change and the increased risk of disasters such as storm, cyclones, flooding and long-term increases in sea level. Minimising these risks by building in less disaster prone areas can be expensive and impossible in countries with coastal locations or island states. All thermal power stations depend on water to cool them. Not only is there increased demand for fresh water, but climate change can increase the likelihood of drought and fresh water shortages. Another impact for thermal power plants, is that increasing the temperatures in which they operate reduces their efficiency and hence their output. The source of oil often comes from areas prone to high natural disaster risks; such as tropical storms, hurricanes, cyclones, and floods. An example is Hurricane Katrina's impact on oil extraction in the Gulf of Mexico, as it destroyed 126 oil and gas platforms and damaged 183 more [Dr. Frauke Urban and Dr. Tom Mitchell, 2011].

However, previously pristine arctic areas will now be available for resource extraction.

b) Nuclear:

Climate change, along with extreme weather and natural disasters can affect nuclear power plants in a similar way to those using oil, coal, and natural gas. However, the impact of water shortages on nuclear power plants cooled by rivers will be greater than on other thermal power plants. This is because old reactor designs with water-cooled cores must run at lower

internal temperatures and thus, paradoxically, must dump more heat to the environment to produce a given amount of electricity. This situation has forced some nuclear reactors to be shut down and will do so again unless the cooling systems of these plants are enhanced to provide more capacity. Nuclear power supply was diminished by low river flow rates and droughts, which meant rivers had reached the maximum temperatures for cooling. Such shutdowns happened in France during the 2003 and 2006 heat waves. During the heat waves, 17 reactors had to limit output or shut down. 77% of French electricity is produced by nuclear power; and in 2009 a similar situation created a 8GW shortage, and forced the French government to import electricity. Other Cases have been reported from Germany, where extreme temperatures have reduced nuclear power production 9 times due to high temperatures between 1979 and 2007.

In particular:

- The Unterweser nuclear power plant reduced output by 90% between June and September 2003.
- The Isar nuclear power plant cut production by 60% for 14 days due to excess river temperatures and low stream flow in the river Isar in 2006.

Similar events have happened elsewhere in Europe during those same hot summers. Many scientists agree that if global warming continues, this disruption is likely to increase [Frauke Urban and Tom Mitchell, 2011].

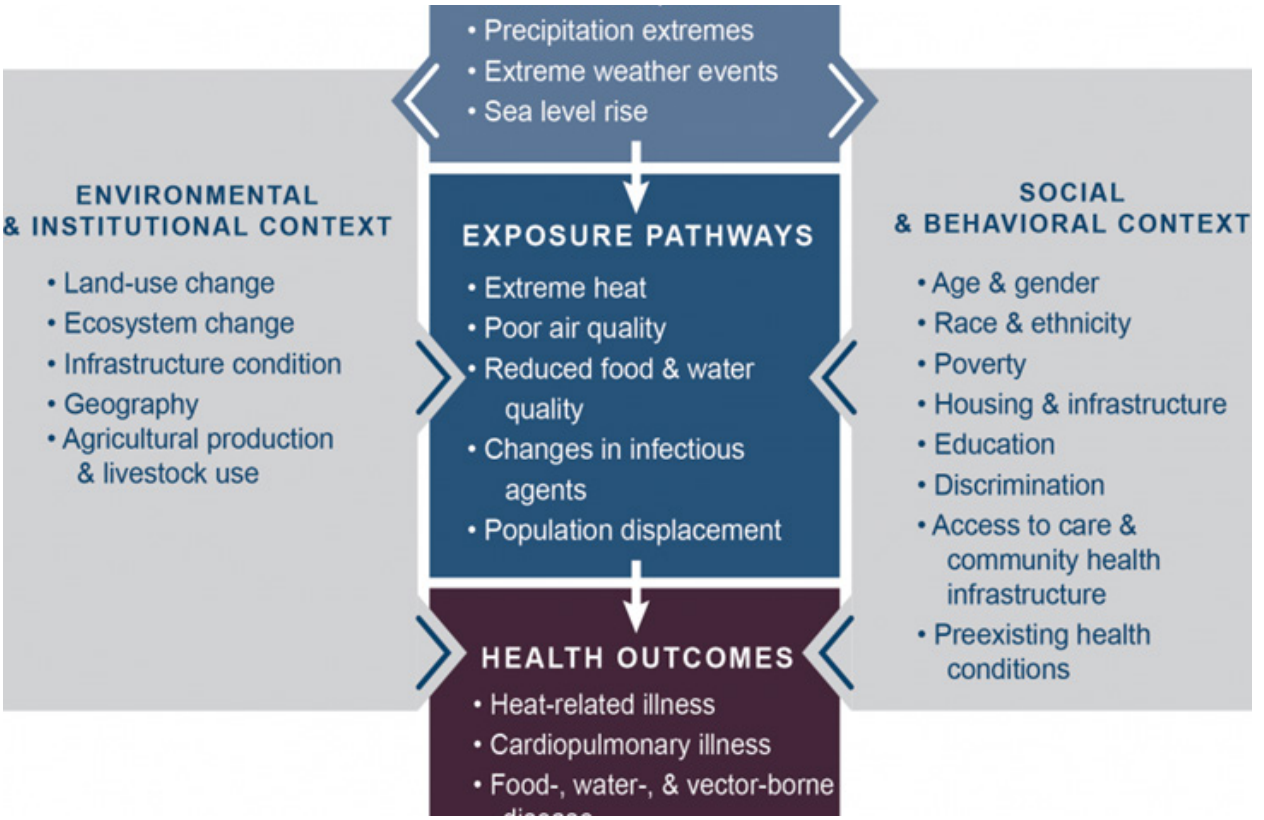
c) Hydroelectricity:

Changes in the amount of river flow will correlate with the amount of energy produced by a dam. Lower river flows because of drought, climate change, or upstream dams and diversions, will reduce the amount of live storage in a reservoir; therefore reducing the amount of water that can be used for hydroelectricity. The result of diminished river flow can be a power shortage in areas that depend heavily on hydroelectric power. The risk of flow shortage may increase as a result of climate change. Studies from the Colorado River in the United States suggests that modest climate changes (such as a 2 degree change in Celsius that could result in a 10% decline in precipitation), might reduce river run-off by up to 40%. Brazil in particular, is vulnerable due to its having reliance on hydroelectricity as increasing temperatures, lower water flow, and alterations in the rainfall regime, could reduce total energy production by 7% annually by the end of the century [Frauke Urban and Tom Mitchell, 2011].

EFFECTS ON HUMAN BEINGS

Effects of climate change on human beings are explained in form of following chart first.

CHART - 1



This Chart - 1 demonstrates the interactions among climate drivers, health impacts, and other factors that influence people's vulnerability to health impacts.

i) Health Impacts:

A fundamental global environmental change, affecting physical systems and ecosystems, will affect human health in many ways. However, many details are debated. What health effects will occur? When will they take place? Will there be both beneficial and adverse effects?

The climate-health relationships that are the easiest to define and study are those in relation to heat waves, the physical hazards of floods, storms, and fires, and various infectious diseases (especially those that are vector-borne). Other important climatic risks to health, from changes in regional food yields, disruption of fisheries, loss of livelihoods, and population displacement (because of sea-level rise, water shortages, etc) are less easy to study than these factors and their causal processes and effects are less easily quantified.

ii) Infectious diseases:

Transmission of infectious disease is determined by many factors, including extrinsic social, economic, climatic, and ecological conditions and intrinsic human immunity. Many infectious agents, vector organisms, non-human reservoir species, and rate of pathogen replication are sensitive to climatic conditions. Both salmonella and cholera bacteria, for example, proliferate more rapidly at higher temperatures, salmonella in animal gut and food, cholera in water. In regions where low temperature, low rainfall, or absence of vector habitat restricts transmission of vector-borne disease, climatic changes could tip the ecological balance and trigger epidemics. Epidemics can also result from climate-related migration of reservoir hosts or human populations. In many recent studies investigators have examined the relation between short-term climatic variation and occurrence of infectious disease—especially vector-borne disease. Studies in south Asia and South America (Venezuela and Columbia) have documented the association of malaria outbreaks with the ENSO cycle.

Increased notifications of (non-specific) food poisoning in the UK and of diarrhoeal diseases in Peru and Fiji have accompanied short-term increases in temperature. Further, strong linear associations have been noted between temperature and notifications of salmonellosis in European countries and Australia, and a weak seasonal relation exists for campylobacter.

It is critical that adaptation and mitigation decisions and policies be developed with a sound basis in the best current science on climate change and its effects. There are gaps in our understanding of the relationship between climate change, the environment, and human health. In its 2010 report, A Human Health Perspective on Climate Change (Full Report) , the NIEHS-led Interagency Working Group on Climate Change and Health identified major research areas that need to be further explored and understood. These include the following:

- Asthma, Respiratory Allergies, and Airway Diseases
- Cancer
- Cardiovascular Disease and Stroke
- Effects of Heat
- Food borne Diseases and Nutrition
- Human Developmental Effects
- Mental Health and Stress-Related Disorders
- Neurological Diseases and Disorders
- Vector borne and Zoonotic Diseases
- Waterborne Diseases
- Weather-Related Morbidity and Mortality

iii) Displacement and Migration:

Climate change causes displacement of people in several ways, the most obvious—and dramatic—being through the increased number and severity of weather-related disasters which destroy homes and habitats causing people to seek shelter or livelihoods elsewhere. Effects of climate change such as desertification and rising sea levels gradually erode livelihood and force communities to abandon traditional homelands for more accommodating environments. This is currently happening in areas of Africa's Sahel, the semi-arid belt that spans the continent just below its northern deserts. Deteriorating environments triggered by climate change can also lead to increased conflict over resources which in turn can displace people.

The IPCC has estimated that 150 million environmental migrants will exist by the year 2050, due mainly to the effects of coastal flooding, shoreline erosion and agricultural disruption. However, the IPCC also cautions that it is extremely difficult to measure the extent of environmental migration due to the complexity of the issue and a lack of data.

According to the Internal Displacement Monitoring Centre, more than 42 million people were displaced in Asia and the Pacific during 2010 and 2011, more than twice the population of Sri Lanka. This figure includes those displaced by storms, floods, and heat and cold waves. Still others were displaced drought and sea-level rise. Most of those compelled to leave their homes eventually returned when conditions improved, but an undetermined

number became migrants, usually within their country, but also across national borders.

Asia and the Pacific is the global area most prone to natural disasters, both in terms of the absolute number of disasters and of populations affected. It is highly exposed to climate impacts, and is home to highly vulnerable population groups, who are disproportionately poor and marginalized. A recent Asian Development Bank report highlights "environmental hot spots" that are particular risk of flooding, cyclones, typhoons, and water stress.

Some Pacific Ocean island nations, such as Tuvalu, Kiribati, and the Maldives, are considering the eventual possibility of evacuation, as flood defence may become economically unrealistic. Tuvalu already has an ad hoc agreement with New Zealand to allow phased relocation. However, for some islanders relocation is not an option. They are not willing to leave their homes, land and families. Some simply don't know the threat that climate change has on their island and this is mainly down to the lack of awareness that climate change even exists. In Vutia on Viti Levu, Fiji's main island, half the respondents to a survey had not heard of climate change. Even where there is awareness many believe that it is a problem caused by developed countries and should therefore be solved by developed countries [Betzold, Carola, 2015].

Governments have considered various approaches to reduce migration compelled by environmental conditions in at-risk communities, including programs of social protection, livelihoods development, basic urban infrastructure development, and disaster risk management. Some experts even support migration as an appropriate way for people to cope with environmental changes. However, this is controversial because migrants – particularly low-skilled ones – are among the most vulnerable people in society and are often denied basic protections and access to services.

Climate change is only one factor that may contribute to a household's decision to migrate; other factors may include poverty, population growth or employment options. For this reason, it is difficult to classify environmental migrants as actual "refugees" as legally defined by the UNHCR. Neither the UN Framework Convention on Climate Change nor its Kyoto Protocol, an international agreement on climate change, includes any provisions concerning specific assistance or protection for those who will be directly affected by climate change [Ferris, Elizabeth, 2007].

In small islands and megadeltas, inundation as a result of sea level rise is expected to threaten vital infrastructure and human settlements. This could lead to issues of statelessness for populations in countries such as the Maldives and Tuvalu and homelessness in countries with low-lying areas such as Bangladesh.

The World Bank predicts that a "severe hit" will spur conflict and migration across the Middle East, Central Asia, and Africa [Lois Parshley, 2016].

iv) Security:

Climate change has the potential to exacerbate existing tensions or create new ones — serving as a threat multiplier. It can be a catalyst for violent conflict and a threat to international security. A meta-analysis of over 50 quantitative studies that examine the link between climate and conflict found that "for each 1 standard deviation (1σ) change in climate toward warmer temperatures or more extreme rainfall, median estimates indicate that the frequency of interpersonal violence rises 4% and the frequency of intergroup conflict rises 14%" [Burke, Marshall; Hsiang, Solomon M.; Miguel, Edward, 2015; and Hsiang, S. M.; Burke, M.; Miguel, E., 2013]. The IPCC has suggested that the disruption of environmental migration may serve to exacerbate conflicts, though they are less confident of the role of increased resource scarcity. Of course, climate change does not always lead to violence, and conflicts are often caused by multiple interconnected factors.

A variety of experts have warned that climate change may lead to increased conflict. The Military Advisory Board, a panel of retired U.S. generals and admirals, predicted that global warming will serve as a "threat multiplier" in already volatile regions. The Centre and the Centre for a New American Security, two Washington think tanks, have reported that flooding "has the potential to challenge regional and even national identities," leading to "armed conflict over resources." They indicate that the greatest threat would come from "large-scale migrations of people — both inside nations and across existing national borders." [Kurt M. Campbell; Jay Gulledge; J.R. McNeill; John Podesta; Peter Ogden; Leon Fuerth; R. James Woolsey; Alexander T.J. Lennon; Julianne Smith; Richard Weitz; Derek Mix, 2007]. However, other researchers have been more sceptical: One study found no statistically meaningful relationship between climate and conflict using data from Europe between the years 1000 and 2000.

The link between climate change and security is a concern for authorities across the world, including United Nations Security Council and the G77 group of developing nations. Climate

change's impact as a security threat is expected to hit developing nations particularly hard. In Britain, Foreign Secretary Margaret Beckett has argued that "An unstable climate will exacerbate some of the core drivers of conflict, such as migratory pressures and competition for resources." The links between the human impact of climate change and the threat of violence and armed conflict are particularly important because multiple destabilizing conditions are affected simultaneously.

EXPERTS HAVE SUGGESTED LINKS TO CLIMATE CHANGE IN SEVERAL MAJOR CONFLICTS

- War in Darfur, where sustained drought encouraged conflict between herders and farmers
- Syrian Civil War, preceded by the displacement of 1.5 million people due to drought-induced crop and livestock failure
- Islamist insurgency in Nigeria, which exploited natural resource shortages to fuel anti-government sentiment
- Somali Civil War, in which droughts and extreme high temperatures have been linked to violence

Additionally, researchers studying ancient climate patterns (paleoclimatology) have shown that long-term fluctuations of war frequency and population changes have followed cycles of temperature change since the preindustrial era [Zhang, D.; Brecke, P.; Lee, H.; He, Y.; Zhang, J., 2007]. A 2016 study finds that "drought can contribute to sustaining conflict, especially for agriculturally dependent groups and politically excluded groups in very poor countries. These results suggest a reciprocal nature–society interaction in which violent conflict and environmental shock constitute a vicious circle, each phenomenon increasing the group's vulnerability to the other." [Uexkull, Nina von; Croicu, Mihai; Fjelde, Hanne; Buhaug, Halvard, 2016-11-01]

v) Social Impacts:

The consequences of climate change and poverty are not distributed uniformly within communities. Individual and social factors such as gender, age, education, ethnicity, geography and language lead to differential vulnerability and capacity to adapt to the effects of climate change. Climate change effects such as hunger, poverty and diseases like diarrhea and malaria, disproportionately impact children; about 90 percent of malaria and diarrhea deaths are among young children. Children are also 14–44 percent more likely to die from environmental factors, again leaving them the most vulnerable. Those in urban areas will be affected by lower air quality and overcrowding, and will struggle the most to better their situation.

vi) Social effects of extreme weather:

As the World Meteorological Organization explains, "recent increase in societal impact from tropical cyclones has largely been caused by rising concentrations of population and infrastructure in coastal regions." Pielke et al. (2008) normalized mainland U.S. hurricane damage from 1900 to 2005 to 2005 values and found no remaining trend of increasing absolute damage. The 1970s and 1980s were notable because of the extremely low amounts of damage compared to other decades. The decade 1996–2005 has the second most damage among the past 11 decades, with only the decade 1926–1935 surpassing its costs. The most damaging single storm is the 1926 Miami hurricane, with $157 billion of normalized damage [Pielke, Roger A., Jr.; Gratz, Joel; et al., 2008].

The American Insurance Journal predicted that "catastrophe losses should be expected to double roughly every 10 years because of increases in construction costs, increases in the number of structures and changes in their characteristics." The Association of British Insurers has stated that limiting carbon emissions would avoid 80% of the projected additional annual cost of tropical cyclones by the 2080s. The cost is also increasing partly because of building in exposed areas such as coasts and floodplains. The ABI claims that reduction of the vulnerability to some inevitable effects of climate change, for example through more resilient buildings and improved flood defences, could also result in considerable cost-savings in the long term.

vii) Human Settlements:

A major challenge for human settlements is sea-level rise, indicated by ongoing observation and research of rapid declines in ice-mass balance from both Greenland and Antarctica. Estimates for 2100 are at least twice as large as previously estimated by IPCC AR4, with an upper limit of about two meters [Pielke, Roger A., Jr.; Gratz, Joel; et al., 2008]. Depending on regional changes, increased precipitation patterns can cause more flooding or extended drought stresses water resources.

vii-a) Coasts and low-lying areas:

For historical reasons to do with trade, many of the world's largest and most prosperous cities are on the coast. In developing countries, the poorest often live on floodplains, because it is the only available space, or fertile agricultural land. These settlements often lack infrastructure such as dykes and early warning systems. Poorer communities also tend to lack the insurance, savings, or access to credit needed to recover from disasters.

In a journal paper, Nicholls and Tol (2006) considered the effects of sea level rise:

The most vulnerable future worlds to sea-level rise appear to be the A2 and B2 [IPCC] scenarios, which primarily reflects differences in the socio-economic situation (coastal population, Gross Domestic Product (GDP) and GDP/capita), rather than the magnitude of sea-level rise. Small islands and deltaic settings stand out as being more vulnerable as shown in many earlier analyses. Collectively, these results suggest that human societies will have more choice in how they respond to sea-level rise than is often assumed. However, this conclusion needs to be tempered by recognition that we still do not understand these choices and significant impacts remain possible.

The IPCC reported that socioeconomic impacts of climate change in coastal and low-lying areas would be overwhelmingly adverse. The following impacts were projected with very high confidence:

- Coastal and low-lying areas would be exposed to increasing risks including coastal erosion due to climate change and sea level rise.
- By the 2080s, millions of people would experience floods every year due to sea level rise. The numbers affected were projected to be largest in the densely populated and low-lying mega-deltas of Asia and Africa; and smaller islands were judged to be especially vulnerable.

A study in the April 2007 issue of Environment and Urbanization reports that 634 million people live in coastal areas within 30 feet (9.1 m) of sea level [McGranahan, G.; Balk, D.; Anderson, B., 2007]. The study also reported that about two thirds of the world's cities with over five million people are located in these low-lying coastal areas.

vii-b) Cost:

The scientific evidence for links between global warming and the increasing cost of natural disasters due to weather events is weak, but, nevertheless, prominent mainstream environmental spokesmen such as Barack Obama and Al Gore have emphasized the possible connection [Pielke, Roger, 2015]. For the most part increased costs due to events such as Hurricane Sandy are due to increased exposure to loss resulting from building insured facilities in vulnerable locations. This information has been denounced by Paul Krugman and Think Progress as climate change denial.

vii-c) Insurance:

An industry directly affected by the risks of climate change is the insurance industry. According to a 2005 report from the Association of British Insurers, limiting carbon emissions could avoid 80% of the projected additional annual cost of tropical cyclones by the 2080s. A June 2004 report by the Association of British Insurers declared "Climate change is not a remote issue for future generations to deal with; it is, in various forms here already, impacting on insurers' businesses now." The report noted that weather-related risks for households and property were already increasing by 2–4% per year due to the changing weather conditions, and claims for storm and flood damages in the UK had doubled to over £6 billion over the period from 1998–2003 compared to the previous five years. The results are raising insurance premiums, and the risk that in some areas flood insurance will become unaffordable for those in the lower income brackets.

Financial institutions, including the world's two largest insurance companies: Munich Re and Swiss Re, warned in a 2002 study that "the increasing frequency of severe climatic events, coupled with social trends could cost almost 150 billion US$ each year in the next decade" [UNEP, 2002]. These costs would burden customers, taxpayers, and the insurance industry, with increased costs related to insurance and disaster relief.

In the United States, insurance losses have also greatly increased. It has been shown that a 1% climb in annual precipitation can increase catastrophe loss by as much as 2.8% [Choi, O.; A. Fisher, 2003]. Gross increases are mostly attributed to increased population and property values in vulnerable coastal areas; though there was also an increase in frequency of weather-related events like heavy rainfalls since the 1950s.

vii-d) Transport:

Roads, airport runways, railway lines and pipelines, (including oil pipelines, sewers, water mains etc.) may require increased maintenance and renewal as they become subject to greater temperature variation. Regions already adversely affected include areas of permafrost, which are subject to high levels of subsidence, resulting in buckling roads, sunken foundations, and severely cracked runways.

EFFECTS ON GDP:

Pindyck Robert S (2009) while developing the "damage function" expects warming to affect the growth rate of GDP as opposed to the level i.e. he assumes that in the absence of warming real GDP and consumption would grow at a constant rate but warming will reduce this rate, for three reasons:

First, some effects of warming are likely to be permanent; for example, destruction of ecosystems from erosion and flooding, extinction of species, and deaths from health effects and weather extremes. If warming affected the level of GDP directly it would imply that if temperature rise but later fall, for example, because of stringent abatement or geoengineering, GDP could return to its but-for path with no permanent loss.

Second, resources needed to counter the impact of higher temperatures would reduce those available for research and development (R & D) and capital investment, reducing growth. Adaptation to rising temperatures is equivalent to the cost of increasingly strict emission standards, which, as Stokey (1998) has shown with an endogenous growth model, reduces the rate of return on capital and lowers the growth rate.

And third, there is empirical support for a growth rate effect. Using historical data on temperatures and precipitation over the past fifty years for a panel of 136 countries, Dell, Jones, and Olken (2008) have shown that higher temperatures reduce GDP growth but not levels.

CONCLUSION

Climate change is a natural process depends on behaviour of nature which is variable, but it is partly has to do with human-induced pursuit for rapid growth with scientific and technological process. It is a very complex system, and predictability remains a question. The exact connection of the climate scale is an area of active research. What we need to understand is the dynamic processes of nature and human instinct for material progress.

It has been suggested that decarbonisation can reduce CO2 and a deep decarbonisation of the world economy is necessary to remain within the 2oC limit. Since most of the CO2 comes from burning fossil fuels, we therefore need a sharp reduction in the use of fossil fuels or a large-scale system to capture and sequester the CO2 that is used.

If we take into consideration the practical problem-solving approach then each region of the world needs to implement a sensible, economically efficient, deep decarbonisation programme built on the three pillars of energy efficiency, low-carbon electricity and fuel switching.

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3. EFFECTIVESS OF MUNICIPAL SOLID WASTE MANAGEMENT IN TAMIL NADU WITH SPECIAL REFERENCE TO THIRUVALLUR DISTRICT

Dr.P.JAYENDIRA SANKAR, Ph.D., Assistant Professor, College of Administrative and Financial Sciences, AMA International University, Bldg 829, Road 1213, Blk 712, Salmabad, P.O.Box 18041, Kingdom of Bahrain.

ABSTRACT

The study is aimed to identify the effectiveness of solid waste management in Tamil Nadu with special reference to Thiruvallur District. "In recent times, the continuous increase of solid waste is a serious problem with the urban and rural areas. The rapid growth of population and increasing per-capita income has resulted in the generation of enormous solid waste posing a serious threat to environmental quality and human health. Improper disposal of waste often results in spread of diseases and contamination of water bodies and soils. The impacts on these wastes on the economy cannot be ignored and managing them has become a major problem. Municipal solid waste management continues to be a major challenge to local governments in both urban and rural areas across the world, and one of the key issues is their financial constraints". [9] "In Tamil Nadu there are 12 Corporations, 124 Municipalities and 528 Town Panchayats. In total the solid waste generation is 14,600 Tons per day. The Greater Chennai Corporation generates 5000 TPD, 11 Corporation and all Municipalities generate about 7600 TPD and all the town panchayat generates 2000 TPD. The board is advocating the concept of waste segregation at source, waste reduction, recycle and reuse to avoid any environmental issues during handling".

KEYWORDS: Municipal Solid Waste Management, Solid Waste Management in Thiruvallur, Effectiveness of Solid Waste Management in Tamilnadu

INTRODUCTION

The managing of municipal solid waste is a foremost function of all urban local bodies of Tamil Nadu. "All urban local bodies are required to meticulously plan, implement and monitor all systems of urban service delivery especially that of municipal solid waste. With limited financial resources, technical capacities and land availability, urban local bodies are constantly striving to meet this challenge.

With the launch of the flagship programme by the Government of India, Swachh Bharat Mission in 2014 that aims to provide basic infrastructural and service delivery with respect to sanitation facilities to every family, including toilets and adopting the scientific methods to collect, process and disposal of municipal solid waste. The mission focuses on quality and sustainability of the service provision as well as emphasizing on the commitment on every stakeholder to bring about a visible change in society.

The Ministry of Environment, Forest and Climate Change, Government of India has notified the solid waste management rules, 2016. As per the rules, solid waste means solids or semi solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, radio-active waste generated in the area under the local authorities. As per the rules, the local bodies are responsible for the collection, treatment and disposal of solid wastes. The board is the monitoring authority on the said rules and is responsible for granting authorization to local bodies of processing and disposal of solid waste".

At present most of the municipal solid waste in the Tamil Nadu is disposing unscientifically. "This has adverse impacts on not only the ecosystem but also on the human environment. Unscientific disposal practices leave waste unattended at the disposal sites, which attract birds, rodents, fleas etc., to the waste and create unhygienic conditions like odor, release of airborne pathogens, etc. The plastic content of the municipal waste is picked up by the rag pickers for recycling either at primary collection centers or at dumpsters. Plastic are recycled mostly in factories, which do not have adequate technologies to process them in a safe manner".

REVIEW OF LITERATURE

Pandian, Ramanathan and Rawat (2010) "growing waste generation is mainly due to population growth, economic development and changing lifestyles. Primarily responsible for waste management, municipalities and

local agencies have been ineffective in tackling the waste problem. Some issues related to municipal solid waste management are low priority for safe disposal, lack of appropriate organization, insufficient financial and technical resources, a limited number of disposal sites and inadequate knowledge of disposal methodology."

Census (2011) "India is rapidly shifting from agricultural-based nation to industrial and services-oriented country. About 31.2% population is now living in urban areas. Over 377 million urban people are living in 7,935 towns/cities. India is a vast country divided into 29 States and 7 Union Territories. There are three mega cities—Greater Mumbai, Delhi, and Kolkata—having population of more than 10 million, 53 cities have more than 1 million population, and 415 cities having population 100,000 or more."

Sridhar and Kashyap (2012)"the solid waste collection efficiency in the city is 97 per cent, which is slightly less than the Ministry of Urban Development's benchmark of 100 per cent efficiency."

Kumar, Venkata and Rao (2013)"municipal solid waste is simply collected, transported and dumped without treatment or processing. A substantial amount of waste remains unattended at collection centers, roadsides and riverbanks. Most often cows and other stray animals feed on waste dumped in these places. Open dumping of garbage facilitates the breeding of disease vectors and unsanitary dumpsites increase the risk of groundwater contamination."

Sivaraman (2013)"it is as if someone's house is set on fire—he does not wait for the authorities, but quickly makes efforts to stop a disaster. Similarly, people assumed immediate responsibility for cleaning up their neighborhoods as a way to deal with the ineffective waste management system. The Chennai Corporation, in spite of having high waste collection rates, does not have a proper workable plan for solid waste management."

Ahluwalia, Kanbur and Mohanty (2014)"however, in spite of street sweeping, roads remain dirty, spoiling the aesthetic beauty of cities and towns. It is common to see people throw their rubbish onto the street. The prevailing thought is cleaning up is always somebody else's responsibility. The Government of India issued Municipal Solid Waste (Management and Handling) Rules, 2000 to improve waste management. The rules promised environmental sustainability in solid waste management by promoting waste separation, recycling, and use of disposal techniques such as composting and incineration. Government agencies believed privatization to be the panacea for solid waste problems. Under the impetus of Municipal Solid Waste Rules and the privatization drive, Chennai became first city to contract out municipal solid waste management services to a foreign agency, the French company Onyx."

Nandi (2014) "the impoverished rag pickers comprise a social group that resorts to waste picking for meager incomes and some merely for every day survival. Without them, rubbish would not be collected, sorted or recycled. The rag pickers spend their days sorting the endless trash in search of non-biodegradable items they can sell. The landfills are the last point for trash collection, as most recyclables have already been removed by other waste collectors who pick up bags of garbage directly from homes. The activities of the rag pickers are not systematic and they scavenge from one locality to another. They can earn US $2.5 to US $3.5 daily by selling metal, paper, plastic and bricks."

OBJECTIVES OF THE STUDY

→ To study the existing solid waste management system of Tamil Nadu with special reference to Thiruvallur District.

→ To study the physical and chemical characteristics of solid wastes of the study area.

→ To study and compare different methods of waste processing, recovery and to determine their suitability for the waste of the study area.

RESEARCH METHODOLOGY

The present study will be based on secondary data. Data and information will be obtained from published papers, books, periodical, journals, internet websites and official sources. Study of existing system of solid waste management, generation of waste, storage and handling, collection, transfer and transport, processing and recovery, disposal, physical characteristics of waste, and different methods of waste processing, recovery and to determine their suitability for the waste of the study area.

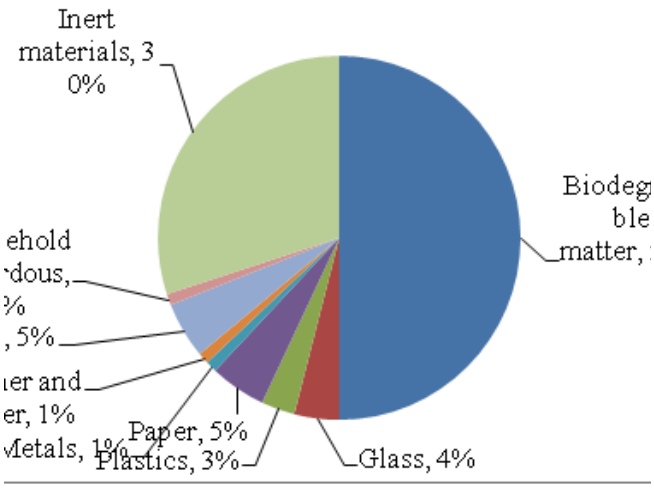
DATA ANALYSIS AND DISCUSSION

"Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This garbage is generated mainly from residential and commercial complexes. In Tamil Nadu due to urbanization and change into lifestyle and food habits, the amount of municipal solid waste has been increasing rapidly and its composition changing".

"In Tamil Nadu, the un-segregated municipal solid wastes generated are collected and are

Table 1 - The Type of Litter Generated and the Approximate Time It Takes To Degenerate

Type of litter	Approximate Time it Takes to Degenerate
Organic Waste (Vegetable and Fruit Peels, Leftover Foodstuff, etc.)	A week or two.
Paper	10-30 days
Cotton cloth	2-5 months
Wood	10-15 years
Woolen items	1 year
Tin, aluminum, and other metal items such as cans	100 to 500 years
Plastic bags	One million years?
Glass bottles	Undetermined



either disposed to low-lying areas or water bodies or disposed to the roadside and are set on fire causing air pollution. The leach ate from the dumped solid wastes has caused water pollution, odor nuisance are mainly caused due to the putrefaction of the organic matter present in the un-segregated municipal solid wastes. Kodungaiyur and Pallikaranai in Chennai are the standing example for municipal solid waste dumping sites".

Table 2 - General Composition of the Municipal Solid Wastes

Biodegradable matter	50%
Glass	4%
Plastics	3%
Paper	5%
Metals	1%
Leather and rubber	1%
Rags	5%
Household hazardous	1%
Inert materials	30%

"Government of Tamil Nadu has issued instructions in all urban local bodies to establish waste processing and disposal facilities. In addition to this, the Honorable Supreme Court has directed cities with one million plus population to file an action plan for solid waste management and all the cities in Tamil Nadu having million plus population namely, Chennai, Madurai and Coimbatore Corporations have filed their action plans before the Honorable Court. The commissioner of municipal administration has taken initiatives in facilitating the preparation of similar Action Plans by all other urban local bodies in order to comply with the municipal solid waste in a time bound manner. The main requirements in this regard are the identification of suitable land for locating disposal facilities".The problem of odor nuisances, fly nuisances, water pollution and air pollution can be eliminated.

All the Municipal authorities as well as the district collectors who are responsible for the implementation of the municipal solid waste management and handling rules, 2000 have been instructed to identify a site away from habitations and water bodies for the composting of compostable wastes and land filling of inert wastes. Tiruppur Municipality has identified a site for composting of segregated wastes. Tiruppur Municipality has engaged a private firm for composting of the segregated wastes. The private acility has also been issued authorization at Madurai to process the municipal solid wastes generated from Madurai Corporation. The facility is yet to be commissioned. All other local bodies are in the process of identification of site for composting and secure landfill. All the municipal commissioners have been instructed to take action to stop the disposal of un-segregated municipal solid wastes into low lying areas and water bodies in order to prevent water pollution. Door to door collection of segregated wastes and two-bin system is being implemented in Udhagamandalam municipality. Municipalities have started the source segregation of municipal solid wastes generated in their limits partially or fully.

→ Stop dumping of garbage at Kodungaiyur and Pallikaranai dump yards

→ Start segregation at the transfer points by using conveyor belt system

→ Take action to put up waste processing facilities at the earliest

The environment problems arising due to indiscriminate use and disposal of throw away plastic items have been recognized and the Tamil Nadu pollution control board has embarked upon an intensive awareness campaign. The awareness campaign has focused on preventing the use of throw away plastics as well as eco friendly substitutes to plastic items. Billboards educating the people about the ill effects of throwaway plastics were displayed on metropolitan transport corporation buses in Chennai. Besides, regular awareness programmes are conducted in tourist and pilgrim centers and also the girivalam path of Thriuvannamalai temple. Training has been imparted to self help groups for production of palm leaf plates, cups in Salem, Vellore and Cuddalore districts through the central palmgur and palm products institute of village industries commission. The products are eco friendly alternatives to throw away plastics items like cups, plates etc. The Nilgiris district, Hogenakkal, Kodaikannal, Rameshwaram, Valparai, Yelagiri, Yercaud and Thirumoorthy falls etc. have been declared as throwing away plastic free zones. The Government of India, Ministry of Environment and Forests notified the Recycled Plastics Manufacture and Usage Rules, 1999 under the Environment (Protection) Act, 1986 to ensure that carry bags and containers used for packing food stuff are not made of recycled plastics. As per the provision of the rules, only virgin plastics, permitted additives and colour are to be used in plastic items shall use for packaging food stuff. The board has identified 1159 plastic products manufacturing units".13

"In Thiruvallur district the solid waste generation is the highest in Ambattur among municipalities and in Porur among town panchayats. The overall collection efficiency is 88 % with of 344 persons engaged in solid waste management. The primary component of the waste is compostable matter constituting 90% in the total waste".

Total Solid Waste Generated per Day in the Town	32 Metric Tons
Total Solid Waste Cleared per Day	2 Metric Tons
Number of Compost Yards Available and Extent	2
Number and Type of Vehicle used Lorry / Tractor / Compactor	Lorry - 1 Tractor -3
Carrying Capacity of all Vehicles per Trip	Lorry - 2.5 Metric Tons Tractor - 2 Metric Tons

The total solid waste generated per day in town is 32 metric tons and the total solid waste cleared per day is 2 metric tons. Number of compost yards available and extent in the town is 2. Number and type of vehicles are 1 lorry and 3 tractors. The carrying capacity of lorry is 2.5 metric tons and tractor is 2 metric tons per trip. Average number of trips per day is lorry with 2 trips, tractor with 2 trips and agro tractor 3 trips. Privatization done to collect the solid waste in all the wards with 2 tractors and 6 tricycles.

CONCLUSION

This study has found the municipal solid wastes management system in Thiruvallur district has increase in waste generation. The general public should be responsive of the separation at the disposal level itself. The administrative body of the study area is not able to solve the mounting problems of throw away and hygiene with its available infrastructural facilities and also with the negligence. They should be given proper training to store wet throw away and dry throw away separately. The separated dry throw away and wet throw away should be collected from the houses individually in order to enhance the efficiency of management. In the study area it is difficult in the recent years because of the rapid urbanization. In the stations the collected dry throw away and wet throw away should be separated again. Natural method should be used for the biodegradable throw away. The waste plastic and polyethylene plastics should be sent to the plastic recycle centers, waste papers should be moved to the pulp factory and printing presses and collected waste cloths should be properly used as required. The necessary suggestions will be given based on the study and observation made in the study area.

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4.GLOBAL WARMING AND ENVIRONMENTAL IMBALANCE

Dr. RAKESH A. JOSHI, Associate Professor, Department of Economics,Saurashtra University, RAJKOT (Gujarat)
FALGUNI S. VYAS, Asso. Professor, J. J. K. Com. College,RAJKOT

INTRODUCTION

The natural resources like earth, wind, water, trees are the basis of human-life. For the bright future of human beings, it is essential to use these resources with a great care. 'Environment' means the physical, chemical and biological surroundings in which an organism exists. Thus, environment is the gift of nature. Prior to 20th century, there was no major evidence of human influence on environment. Environmental degradation up to this period was mainly due to natural disasters, like cyclone, earthquake etc. Up to that period; natural resources were not used beyond their regenerative capacities. So, what was used, was regenerated. But, after the population explosion in the world, the situation started changing. Gradually, this led to serious environmental degradation behind which, the need and greed of human kind is responsible. Ever increasing pollution, demolition of forests and bio-diversity, increase in global warming, etc. have alarmed us for awareness of environmental protection. Worldwide environmental awareness was started during the 1960s. The main impetus came from the publication of a book 'Silent Spring' by Rachel Carson in 1962. This book revealed the risk of using some pesticides and their bad effects on human life and thereby showed the necessity for the protection of earth. The world summit held at Rio-de-Janero in 1992, had focused the attention towards environmental problems. The economists also started looking afresh to the central economic problem of resource scarcity in relation to their possible uses. After 1970, many economists started arguing that development can be made sustainable only with efficient and judicious use of natural resources. In this paper, we have described various factors responsible for environmental hazards and we have also suggested our duties regarding the protection of the earth.

GLOBAL WARMING

Climate change is the single biggest environmental and humanitarian crisis of our time. Western countries are major contributors to global warming and toxic air pollution. Climate change means a change in climate that persists over a sustained period of time. Examples of climate change are global warming, changes in rainfall patterns and changes in the frequency of extreme weather events. The instrumental temperature record shows increased global warming of around 0.6 C. over the entire 20th century.

Global Warming will affect India because, in South Asia, warming has been projected to be above the global average. The impact projection for India indicates an increasing trend in the annual mean temperature.

The effects of global warming are the environmental and social changes caused by human emissions of greenhouse gases. Many impacts of climate change have already been observed e.g. glacier retreat, changes in the timing of seasonal events and changes in agricultural production and productivity. In all regions, some people are particularly at risk from global warming e.g. the poor, children and elderly.

GLOBAL WARMING AND FOOD SUPPLY

Low-latitude areas are at the most risk of having decreased crop yields. Some evidences suggest that, droughts have been occurring more frequently because of global warming and they are expected to become more frequent and intense in Africa, southern Europe, the Americas, Australia, south East Asia and west Asia. Droughts results in crop failures and the loss of pasture grazing land for livestock.

An increase in temperatures of 0.5 C. to 1.5 C. could produce a decline of wheat and maize production in India between 1% to 2.5%. In India, with predominantly agrarian economy, the projected increase in temperature will dampen economic growth by reducing agricultural productivity.

ENVIRONMENTAL HAZARDS

The world had to accept two very serious problems as unwanted gifts in the 20th century; first is population – explosion and another is environmental – imbalance. The problem of population explosion is limited up to Asia, Africa and Latin America; while the problem of pollution or environmental hazards has spread over the whole world. In this context, necessity to protect the earth should be the first priority. The proper combination and balance between the natural resources and human-population is called environment, and environment is a part of the earth. When excessive use of natural resources due to unlimited human-wants takes place; the earth becomes unsafe,

Before two generations, the human-wants of our elders were very limited, so, the earth was safe and protected. But ever increasing population and ever-increasing demand for the materialistic consumption; it is very difficult for human beings to live on this earth. Since the inception of 20th century, there has been a fast industrial development in various countries of the world. The production of necessities and prodigal goods has increased a lot. In the 2nd world war, atom bombs were dropped on Japan, and thereafter so many countries have been experimenting atomic energy privately or publicly for the destructive purpose. The problem of pollution has increased seriously with the process of national economic development. In India at least 86,400-ton insecticides are used annually, which creates air pollution as well as soil-degradation. In urban areas, heavy industrialization and increasing number of vehicles are the major responsible factors in generating pollution of air, water and sound. 8.5% of the total vehicles in our country are in Mumbai, Delhi and Kolkata. So, 470 T.P.D. in Mumbai, 810 T.P.D. in Delhi and 1887 T.P.D. in Kolkata, Carbon Monoxide mixed in the air, in 2001. But, due to use of CNG, this volume has decreased a little now. Carter Brandun and Christan Homan have written that every year at least 40,000 people die in India due to pollution. Industries like aluminum, cement, bricks, chemical, colour, plastic, rubber, pharmaceuticals, pesticides, fertilizers, thermal power, etc. pollute the atmosphere leaving carbon dioxide, carbon monoxide, sulfur dioxide, nitrogen oxide and hydrocarbons. The temperature has been rising due to pollution. Undue changes are coming in the climate. The rivers, ponds, lakes and oceans have become means to dispose the industrial waste. These increase problems regarding human and animal health. T.B.,Cancer, Skin diseases ,Bronchitis etc. are the outcome of pollution. The polluted water gets absorbed in the cultivation land and it creates serious problems regarding the fertility. Though forests are very useful for environment, in our country only 23% land is forest land and in Gujarat only 8% land is forest land. Every year 13 lakhs hectare land under forests decreased due to cutting of trees and land encroachments. Floods, land erosion, construction of dams etc. are also responsible for deforestation.

Considering the whole narration, we can say that there is a serious crisis of environmental and ecological degradation in this century. It is certain that, the time has come to think some plans and actions regarding the protection of earth. It is not certain that India would be super power of the world, but it is certain that India is and would be one of the most polluted countries in the world. We are not able to breathe pure air, not able to eat pure food and not able to drink pure water.

OUR DUTIES TO PROTECT THE ENVIRONMENT

For the protection of the earth economists, scientists, engineers, environmentalists, government and the people should think some concrete policies.

(i) Environmental policy is essential for solving environmental hazards. It may be defined as a set of legal, administrative, governmental and social plans and policies to control pollution and to protect the earth. In India, we have also formulated such policy, but the implementation part is somewhat weak. Such type of policy must be implemented strictly by the administration.

(ii) Government alone can not solve the environmental problems. There should be co-ordination of government's action with N.G.Os., pollution affected people and the polluters. Peoples' participation is essential in all stages of environmental protection. In our Indian culture, we worship natural resources or environment, so, without peoples' involvement, this great task cannot be done. People with some social movement can protect the earth. The 'Chipko Movement', Narmada River movement, Samaj Parivartan Samuday's movement, Silent Valley and Dun Valley movement are the good examples.

(iii) Various industries should manage to control pollution. The industries like textiles, cement, chemicals, drugs, plastic, petro-chemicals should be established at least 15 km. away from the residential areas of cities and villages.

(iv) Tree plantation is the best way to protect the earth. Trees absorb polluted air and provide clean air. After the tree plantation, it is our duty to maintain them in proper way. Students can accelerate this work with the help of N.S.S., N.C.C. and Scout-Guide activities.

(v) Gandhiji wanted ruralisation instead of urbanization, as he knew the dangerous outcome of urbanization and industrialization. In this context, cottage, rural and small-scale industries should be motivated by the government. These industries create a little pollution. Prof. Schumacher also agrees about the usefulness of Gandhian thoughts for solving environmental problems.

(vi) The new buzzword in the international industrial circle is clean technology. The ultimate aim of clean technology or technology to ensure clean production is to reduce the

generation of wastes and toxic emissions. It is a creative way of thinking about products and processes that help in reducing pollution at source and enhance profitability. Organic farming is also useful for the protection of earth, as it does not require chemical fertilizers and pesticides.

(vii) We should increase the use of various natural energies like solar energy, wind energy, water energy, ocean energy, bio-gas energy etc. The use of CNG in automobiles is also useful to reduce the pollution. Some proportion of ethanol must be mixed in Petrol / Diesel. It reduces the pollution of air.

(viii) Our Indian culture has the respected place for festival and celebrations. We should celebrate the following days, so that the work of earth protection can become speedy:

(a) February 2 – World Wetland Day – Wetlands are very important part of our biodiversity and it is necessary to see that they are well protected.

(b) February 28 – National Science Day – It is necessary to highlight the contribution of science in the protection of the environment.

(c) March 21 – World Forestry Day – Planting the trees and highlighting the urgency to increase the green cover, is useful for the earth.

(d) March 22 – World Water Day – The decision to celebrate this day has been taken recently as drinking water source are fast depleting.

(e) March 23 – World Meteorological Day – Just to remind everybody that weather is an integral part of the environment.

(f) April 7 – World Health Day – WHO was established on this day in 1948. In the changing environment, health is an important issue.

(g) April 18 – World Heritage Day – Just to give equal respect to human beings.

(h) April 22 – Earth Day-Since 22/4/1970, this day has been celebrated all over the world as Earth Day.

(i) May 31- Anti Tobacco Day- We can take up an anti smoking campaign in our society or in our office.

(j) June 5 – World Environment Day – On June 5, 1972, the Stockholm Conference on Human Environment was held in Sweden. Tree plantation should be done on this day.

(k) July 11 – World Population Day – Increasing population is a serious problem and such message should be spread.

(l) September 16 – World Ozone Day – The United Nations declared this day as the International Day for the prevention of the Ozone Layer.

(m) September 28 – Green Consumer Day – Awareness building on the importance of recycling and reusing goods should be taken up seriously.

(n) October 3 – World Habitat Day – Increasing human activities is threatening the habitat of other living things.

(o) October 1-7 – World Wildlife Week – Celebrate this week by creating awareness on the importance of preservation of our wildlife.

(p) October 13 – International Day for Natural Disaster Reduction – Efforts should be taken to reduce the natural disasters.

(q) November 14 – Children's Day in India – Children can work together for a better future by improving the environment around them.

(r) December 2 – Bhopal Tragedy Day – Mark this occasion by our best efforts to prevent such a tragedy from occurring again.

We humbly hope that by above mentioned efforts we can make our earth clean and green. That will control global temperature also. It is after all a planet, we borrowed from our children and when we leave behind this property let it not feel like a burning cauldron of waste, all in the name of convenience.

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5.CLIMATIC CHALLENGES AND ENVIRONMENTAL POLLUTION IN INDIA

Dr.T.SARATHY, Associate Professor (PRIMS),Periyar University, Salem, Pincode -636 011.

ABSTRACT

Global climate change is a change in the long-term weather patterns that characterize the regions of the world. The term "weather" refers to the short-term (daily) changes in temperature, wind, and/or precipitation of a region. In the long run, the climatic change could affect agriculture in several ways such as quantity and quality of crops in terms of productivity, growth rates, photosynthesis and transpiration rates, moisture availability etc. Climate change is likely to directly impact food production across the globe. Increase in the mean seasonal temperature can reduce the duration of many crops and hence reduce the yield. In areas where temperatures are already close to the physiological maxima for crops, warming will impact yields more immediately. Drivers of climate change through alterations in atmospheric composition can also influence food production directly by its impact on plant physiology. The consequences of agriculture's contribution to climate change, and of climate change's negative impact on agriculture, are severe which is projected to have a great impact on food production and may threaten the food security and hence, require special agricultural measures to combat with.

Although India has a rich and long history of environmental laws dating back to the 1970s, it still ranks very low on air and water pollution levels compared to the rest of the world resulting in higher rates of infant mortality and lower life expectancy rates. Poor sanitation conditions and sewage problems compound the problem affecting the health of ordinary citizens in India. The reasons for this disconnect between enlightened environmental laws and high levels of pollution could be traced to existing environmental laws, discrepancies in the environmental guidelines for businesses to follow between the central government and at the state levels, and the existence of a large number of SMEs who neither have the resources nor the technical skills to adhere to the existing environmental laws. Using extensive secondary research, this paper suggests a series of steps to help the country achieve safe air and water pollution levels resulting in improved health conditions for its citizens. The cornerstone of the prescription for improvements in the environment is a collaborative arrangement that brings together the various government agencies, the citizens, SMEs, large domestic companies, and NGOs to participate in a collaborative arrangement to educate, streamline effective policies, develop the necessary institutional infrastructure, and provide adequate funding for improving the environment.

KEY MESSAGES

• Climate change (increases in temperature, changes in precipitation and decreases in ice and snow) is occurring globally; some of the observed changes have established records in recent years.

• Observed climate change has already led to a wide range of impacts on environmental systems and society; further climate change impacts are projected for the future.

• Climate change can increase existing vulnerabilities and deepen socio-economic imbalances across the world.

• Damage costs from natural disasters have increased; the contribution of climate change to these costs is projected to increase in the future.

• The combined impacts of projected climate change and socio-economic development can lead to high damage costs; these costs can be reduced significantly by mitigation and adaptation actions.

• On-going and planned monitoring and research at national level can improve assessments of past and projected impacts of climate change, thereby enhancing the knowledge base for adaptation.

INTRODUCTION

India is both a major greenhouse gas emitter and one of the most vulnerable countries in the world to projected climate change. The country is already experiencing changes in climate and the impacts of climate change, including water scarcity, heat waves and drought, severe storms and flooding, and associated negative consequences on health and livelihoods.

With 1.2 billion but growing population and dependence on agriculture, India probably will be severely impacted by continuing climate change. Global climate projections, given inherent uncertainties, indicate several changes in India's future climate.

Global observations of melting glaciers suggest that climate change is well under way in the region, with glaciers receding at an average

rate of 10–15 meters per year. If the rate increases, flooding is likely in river valleys fed by these glaciers, followed by diminished flows, resulting in water scarcity for drinking and irrigation.

• All models show a trend of general warming in mean annual temperature as well as decreased range of diurnal temperature and enhanced precipitation over the Indian subcontinent.

A warming of 0.5 degree C is likely over all India by the year 2030 (approximately equal to the warming over the 20th century) and a warming of 2-4degree C by the end of this century, with the maximum increase over northern India.

Increased warming is likely to lead to higher levels of tropospheric ozone pollution and other air pollution in the major cities.

• Increased precipitation including monsoonal rains is likely to come in the form of fewer rainy days but more days of extreme rainfall events, with increasing amounts of rain in each event, leading to significant flooding.

Drizzle-type precipitation that replenishes soil moisture is likely to decrease. Most global models suggest that the Indian summer monsoons will intensify. The timing may also shift, causing a drying during the late summer growing season.

Climate models also predict an earlier snowmelt, which could have a significant adverse effect on agricultural production. Growing emissions of aerosols from energy production and other sources may suppress rainfall, leading to drier conditions with more dust and smoke from the burning of drier vegetation, affecting both regional and global hydrological cycles and agricultural production.

CLIMATE CHANGE

Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Climate change may refer to a change in average weather conditions, or in the time variation of weather within the context of longer-term average conditions. Climate change is caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions. Certain human activities have been identified as primary causes of ongoing climate change, often referred to as global warming.

Climate change has emerged, in recent times, as an important area of both international as well as domestic policy making and development planning. The recent Assessment Report of the Inter governmental Panel on Climate Change (IPCC) has shown that climate change would have significant impact on myriad economic sectors and ecosystems. Climate variability and change can slow down the pace of development either through adverse impacts on natural ecosystems or erosion of the adaptive capacity of people and society. Climate change is, therefore, not only a major global environmental problem, but an issue of great concern to a developing country like India.

ENVIRONMENT AND HEALTH

Indoor and outdoor air pollution linkages to health burden, especially among women children and elderly in rural, urban and semi-urban areas. Water pollution linkages to health burden through indiscriminate use of chemical fertilizers and pesticides leading to non point source water pollution.

IMPACT AND IMPLICATIONS OF CLIMATIC CHANGE

Climate changes noted in the IPCC Assessment reports include recession of glaciers, thawing of permafrost, lengthening of mid- to high-latitude growing seasons, pole-ward and altitudinal shifts of plant and animal ranges, decline in some plant and animal populations, early flowering of trees, and changes in insect populations and egg-laying in birds. Associations between changes in regional temperatures and the observed changes in physical and biological systems have been documented in many aquatic, terrestrial, and marine environments.

RESPONSES TO CLIMATE CHANGE

The serious consequences of climate change, including especially the consequences for India, lead naturally to the question of what should be our response. Two types of responses need to be considered. The first relates to adaptation, i.e., measures that have to be taken given the very high likelihood that climate change will occur and will have adverse effects. The second relates to mitigation, i.e., steps to be taken that might reduce the extent of climate change.

ENVIRONMENTAL ISSUES

There are many environmental issues in India. Air pollution, water pollution, garbage, and pollution of the natural environment are all challenges for India. Nature is also causing some drastic effects on India. The situation was worse between 1947 through 1995. According to data collection and environment assessment studies of World Bank experts, between 1995 through 2010, India has made one of the fastest progresses in the world, in addressing its environmental issues and improving its environmental quality.

The natural environment with its numerous living and non-living resources is man's most precious heritage. The basic goal of environmental conservation is the management

of human use of these natural resources, so that they may yield the greatest sustainable benefits to the present generation while maintaining their potential to meet the needs and aspirations of future generations. Like other nations, India too bears the scars of damage done to its natural environment resulting in a wide array of environmental problems affecting the wellbeing of its citizens. While in the developed countries, environmental problems are largely the by-products of affluence marked by resource wasteful life-styles. The stress on India's environmental resources comes mainly from the pressures for satisfying the basic human needs of a large and growing population. Environment protection is the key to ensure a healthy life for the people. Environmental problems are on the increase and are more prominent in densely populated cities. Exploding urban migration, as experienced in the last decade, is bound to widen the gap between demand and supply of infrastructural services such as energy, housing, transport, communication, water supply, sewerage and solid wastes disposal and recreation for communities. The release of high level of sulphur dioxide, carbon monoxide, oxides of nitrogen and suspended particulate matter by industries and vehicles to atmosphere is adding to air pollution.

The area around Manali near Chennai, the belt of Vaniyambadi to Ranipet in Vellore District due to tanneries, textile and dyeing industries in and around Tiruppur and Erode towns, Cuddalore SIPCOT are most prone to industrial pollution in Tamil Nadu.

ENVIRONMENTAL AWARENESS AND EDUCATION

The Environment Education in School System project initiated in 1999 strengthens environment education in the formal school curriculum through infusion of appropriate education material. Introduction of environmental concepts in Business/ Management Education is another focus area. A committee comprising representatives from management institutions, AICTE,UGC, industry experts, and MoEF is working on this. During the Eleventh Plan, the programme of Environmental Education, Training, and Extension may be continued with further linkages with the publicity and awareness mechanisms of State forest departments. This may include a manual on public participation in all activities of MoEF. Public transport like railways, buses, and even airways can be extensively used for environmental awareness through well designed awareness material. Information generated by student activities on local environmental issues may be integrated with the database under the National Environmental Monitoring Programme (NEMP). Capacity building programmes such as training of trainers, should also be focused on.

The National Museum of Natural History (NMNH), New Delhi, and three regional museums at Mysore, Bhubaneshwar, and Bhopal will be made more effective in natural history education and awareness with the introduction of the state-of-the-art education and interpretation methods. The MoEF has contemplated setting up of a new regional museum at Sawai Madhopur with focus on the life forms of the region, the details of which are being worked out.

NATIONAL ENVIRONMENTAL MONITORING PROGRAMME (NEMP)

The Steering Committee on Environment and Forests for the Eleventh Plan has suggested a unified NEMP for ecology, environmental chemistry, public health, and socio-environmental studies. This programme would track the status and change in the socially relevant biophysical parameters and their social impacts, wherever possible. NEMP may have sub-programmes on forest cover and ecosystem services, apart from air and water pollution.

The programme may have linkages with educational, scientific, and social organizations working in the relevant fields. Accordingly, the existing programme for Environment Information System (ENVIS) will be reshaped to provide information in interactive formats for effective use. Real time sharing of data on environmental parameters collected under NEMP will be implemented.

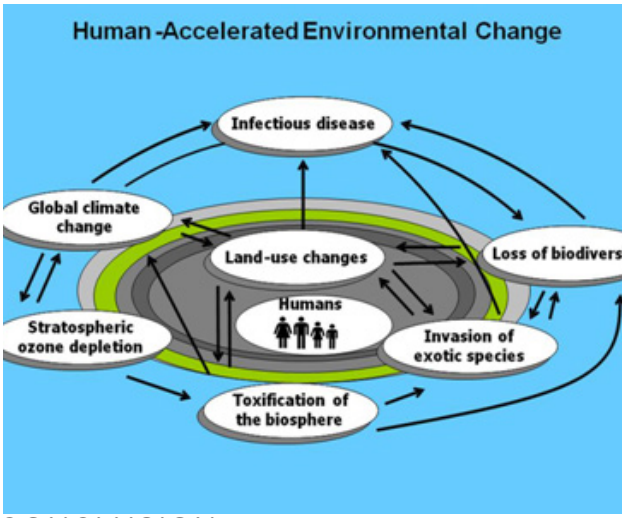
ENVIRONMENTAL RESEARCH AND DEVELOPMENT

The MoEF supports Centres of Excellence in research which needs to be strengthened.

During the Eleventh Plan period, environmental policies and programmes will need strong research backup. The identified research priorities will be met by a combination of open, competitive research grant programmes, and dedicated support to special organizations and centres of excellence. An 'Environmental Research Grants' programme should focus on the relevant areas such as clean technologies, preventive strategies, hazardous substances management, and so on. There should be special programmes on Ecosystem Health, Pollution and Health, Ecological Footprint, NTFP regeneration ecology, Invasive species, Fire Ecology, and Forest- Watershed Services.

• Documentation of traditional and community knowledge should be a special area of research.

• Special mechanisms may be set up for co-ordination and management of research amongst agencies like Indian Council of Forestry Research and Education
(ICFRE), ICAR, CSIR, DBT, DST, and UGC, as well as multilateral and bilateral donors and private foundations.



CONCLUSION

Climate change and loss of biodiversity undermines sustainable development. However, there is no dichotomy between economic progress and protecting our environment by limiting climate change and loss of biodiversity. Indeed, the cost to mitigate climate change is less than the cost of inaction if one takes the ethical position of not discounting future generations, and delaying action can significantly increase costs. Efficient resource use (e.g., energy or water) saves money for businesses and households. Valuing and creating markets for ecosystem services can provide new economic opportunities. A green economy will be a source of future employment and innovation. Governments, the private sector, voluntary and civil society at large all have key roles to play in the transition to a low-carbon economy, adaptation to climate change and a more sustainable use of ecosystems. If we are to achieve our dream, the time to act is now, given the inertia in the socioeconomic system, and that the adverse effects of climate change and loss of biodiversity cannot be reversed for centuries or are irreversible (e.g., species loss). Failure to act will impoverish current and future generations.

Climate change, the outcome of the "Global Warming" has now started showing its impacts worldwide. Climate is the primary determinant of agricultural productivity which directly impact on food production across the globe. Agriculture sector is the most sensitive sector to the climate changes because the climate of a region/country determines the nature and characteristics of vegetation and crops. Increase in the mean seasonal temperature can reduce the duration of many crops and hence reduce final yield. Food production systems are extremely sensitive to climate changes like changes in temperature and precipitation, which may lead to outbreaks of pests and diseases thereby reducing harvest ultimately affecting the food security of the country. The net impact of food security will depend on the exposure to global environmental change and the capacity to cope with and recover from global environmental change.

Coping with the impact of climate change on agriculture will require careful management of resources like soil, water and biodiversity. To cope with the impact of climate change on agriculture and food production, India will need to act at the global, regional, national and local level. The rapid economic growth experienced by India is resulting in adverse and harmful environmental conditions that are affecting the people of India as well the wider global population. In the case of India, this is further exacerbated by the high population density and growth rates. The existing environmental laws, although cover a wide spectrum of environmental concerns, they seem to be ineffective due to lack of enforcement, the lack of resources, and technical challenges faced by a large number of Indian companies, especially the SMEs. Under these conditions, India has to adopt some sustainable actions that need to address the myriad issues facing the country including environmental degradation in order to sustain its prospects for continued economic growth.

Sustainable development, that is, both a prosperous economy and a healthy environment that in many respects is the goal of diverse interest in the area of environmental issues, is the key for the future of India and the world. Sustainable development implies managing the diverse interests of a prosperous economy and simultaneously maintaining a healthy environment. Based on extensive literature search, we recommend that India undertake a new approach in the fight against environmental pollution. The key element of this new initiative is the shared and cooperative participation of the people, the government, the industrial sector, and NGO's. This type of approach seems to have worked for a few countries and it appears to be a doable solution for India too.

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6. IMPACT OF ENVIRONMENTAL POLLUTIONS AND WASTE MANAGEMENT

A.KAVERI, Ph.D Research Scholar, Department of Economics, Thiruvalluvar University, Serkkadu, Vellore -632115.

Dr.S. DHANASEKARAN, Assistant Professor, Department of Economics, Thiruvalluvar University, Serkkadu, Vellore-632115.

ABSTRACT

This paper will discuss the problem of environmental pollution and waste management. Everything that surrounds us is directly or indirectly connected to the environment. Not only the man, but also other living beings as well as the nature (volcanic eruptions, earthquakes) have effects on environmental pollution. Environmental pollution is present from the very beginning of life, but today it is a serious problem that threatens the survival of mankind. During the preparation of scientific research, we noticed a problem: "What is the influence of the waste management on the environment?" Today, every person living on planet Earth is worried about environmental pollution because the consequences faced every day, through the air we breathe, the food and water we consume, through pollution and radiation we are exposed to. Also, the consequences of environmental problems are manifested through the lack of natural resources, extinction of plant and animal species, as well as the problems in the global ecosystems and biochemical processes. Based on the research problem we can hypothesize: Yes, waste management has a great impact on the environment.

INTRODUCTION

The man, along with all other living beings from the beginning of its existence is closely linked with the entire inanimate and living nature that surrounds it. This interaction is the basis of the whole modern right of environmental protection. Through his own development, the man developed his interest in the way and manner that would harmonize with the nature that surrounds it, to ensure the conditions necessary for their survival. With each new discovery (ranging from tools for tillage and wheel all the way to modern computer technology) man makes bigger part of the eternal desire to reconcile nature and its needs. Contemporary urban, industrial, economic and technological development has provided great benefits to man, but the industrial air and water pollution, uncontrolled deforestation and their conversion into agricultural land, destruction of the ozone layer and global warming of the planet followed by climatic changes, the accumulation of various wastes, including radioactive as well as the eradication of certain plant and animal species, are just some of the negative consequences of human activities, which, however, seriously endangering his own survival. At present time, the protection of the environment is of great importance in the prevention and elimination of these contradictions. The right to protect the environment today should be seen as a unique supranational (international), national and local unit. Therefore, in order for the normative framework to succeed, actions must be taken at the universal, national, regional and local levels.

Today we can say that we live in a world of waste; because of population growth and production increasing amounts of waste that makes landfill are becoming more numerous and increasingly degrade the environment. Every day a huge amount of waste, equally as in the villages and in agricultural areas is produced. Every year, about 10 million tons of oil products reaches rivers and oceans and has more than 500 billion tons of industrial waste. Industrial facilities and transport throw into the atmosphere about a billion tons of aerosols and ash. At the landfill waste is collected for years. In the wild landfill reaches up to 70% of total waste. The biochemical processes of decomposition of waste adversely affect the environment. As for municipal waste that contaminates the soil and plants, air, groundwater and surface water on them in huge quantities reproduce rats, mice and insects, which contributes to the spread of infection. This new situation poses a threat to human health, for both present and future generations. This imposes the problem of protecting the environment through waste management.

ENVIRONMENTAL POLLUTION

The result of deteriorating environmental situation in various countries and regions where environmental pollution is the most intense climate is warming; ozone layer is depleting, desertification. According to the definition adopted by the Un Organization, "pollution is exogenous chemical substances encountered on a suitable place, at the appropriate time and in inadequate quantities." According to

the analysis (taken in early 20th century), it is concluded that the most polluted spheres Are atmosphere and hydrosphere. Even the state of cosmic space around our planet raises serious concerns. In order to define the concept of the environment, we must consider the basic ecological Unit that has its own laws, which is characterized by complex factors of animate and inanimate nature. This unit is called an ecosystem. The man as a conscious being has a great influence on the Environment. According to the methodology of the World Health Organization, there are 26 risk factors to health, some dating from the environment that are considered to cause many diseases in the population of children aged 0 to 19 years.

WASTE MANAGEMENT

In the middle Ages, food waste was dumped on the streets, so the rodents and insects transmitted many infectious diseases and dangerous epidemics. Today, because of inadequate treatment of waste could be a higher number of infectious diseases. The general interest of society in our country, governed by the Law on Waste Management is the management of waste. The objective of this law is to provide and ensure the conditions for waste management in a way that does not endanger human health and the environment

LAW RELATING TO WASTE MANAGEMENT IS BASED ON THE FOLLOWING PRINCIPLES

1. The principle of optimal choice of options for the environment 2. The principle of proximityand regional approach to waste management 3. The principle of hierarchical waste management 4. The principle of accountability5. The 'Polluter Pays' Principle.

DISPOSAL HAS ITS DISADVANTAGES

1. If you make a wrong selection of underground landfill, it can contaminate groundwater.

2. When waste is buried and located in the middle of the country, there is no oxygen and its decomposition. Biogas is formed, which consists of various hydrocarbons, mostly methane. Biogas is spread horizontally and can reach the basements of buildings and in contact with open fames it can ignite and explode.

3. When waste is decomposed, its volume decreases, and this causes sagging area, so that in these places we cannot make buildings and other facilities.

INDUSTRIAL WASTE MANAGEMENT

A huge number of wastes are created by technological and technical activities, but several types are Re-used: metal, plastic, paper, glass. A number of issues from environmental protection consider the Re-use of materials: to reduce the need for primary raw materials, reduce the pollution of water and soil. Industrial waste is divided into:

- Scrap, Waste wood,Waste plastics and other materials, Industrial waste

WASTE MANAGEMENT STRATEGY

"The collection, transport, storage and treatment of waste carry a number of risks to safety and health of employees in the waste industry".The system activities and activities which include the prevention of waste by reducing packaging materials, waste reduction, developing a habit of sorting waste in the population represents waste management. The following activities:

- The introduction of formal legal mechanisms, such as the acquisition of knowledge in the field of waste management.
- Acquisition and improvement of education and training of persons who manage waste
- Establishment of a national body responsible for the development of educational programs and training in the field of waste management

ENVIRONMENTAL POLLUTION

Pollution is explained as any substance introduced into the environment that adversely affects the usefulness of resources. Pollution can be in the form of solid, liquid or gaseous substance. Pollution causes damage to human, plant and animal life. The nature and concentration of pollutant determine the severity of effect of pollution. Pollution is defined as the excess discharge of any substance into the environment which affects adversity quality of environment and causing damage to humans, plants and animals. Types Pollutants

THE POLLUTANTS THAT POLLUTE THE ENVIRONMENT IS DIVIDED INTO FOLLOWING TYPES

1. Air pollution 2. Water pollution 3. Soil Pollution 4. Marine pollution 5. Noise pollution 6. Thermal pollution 7. Nuclear hazards

AIR POLLUTION

It is defined as the undesirable contamination of gas, smoke, dust, fume, mist, odor, or chemical particulates in the atmosphere which are injurious to human beings, plants and animals.

CAUSES OF AIR POLLUTION

1. Industrialization 2. Urbanization 3. Vehicles emission 4. Deforestation 5. Population, Types of air pollutants Air pollutants can broadly classified into two types

1. Primary pollutants
2. Secondary pollutants

Primary pollutants that are emitted directly from either natural events or from human

activities are called primary pollutants. The natural events are dust storms; volcano etc. and human activities can be emission from vehicles, industrial wastes. About 90% of global air pollution is constituted by five primary pollutants. These are

1. Carbon oxides (CO and CO2) 2. Nitrogen oxides 3. Sulphur oxides4. Hydrocarbons
5. Particulate matter

WATER POLLUTION

Any physical, biological or chemical change in water quality that adversely affects living organisms or makes water unsuitable for certain use is referred as Water pollution. When the quality or composition of water changes by means it becomes unsuitable for any purpose and is said to be polluted. Water pollution Sources Water pollutants are categorized as point source pollution and non-point source pollution.

1. Point source pollution (Example: Industrial discharge, factory smoke stack, municipal sewage etc.)
2. Non-Point source of pollution (Example: run off from farm lands, construction sites, parking lots, agriculture logging, and animal waste.)
3. Causes of Water Pollution

•Biochemical Oxygen Demand (BOD),Nutrients, Suspended solids/ Sediments, Bacteria, Viruses and protozoa.

The concern associated with microorganism's infectious disease. Microorganisms are naturally found in water and elsewhere in the environment and can cause infection. However, the microbes causing the greatest concern are usually associated with human activities. Nonpoint sources include run-off from livestock operations and storm water runoff especially that associated with combined sewer overflow. Poorly performing municipal sewage treatment plant are point sources of pathogenic microorganisms.

WATER POLLUTION

SOURCE OF WATER POLLUTION	Comment
Water and sewage company works	Organic wastes and sometimes industrial wastes. Aluminum residues from water treatment
Petroleum industry	Oil spills from ships, oil supertanker disasters and offshore drilling operations.
Acid rain	Formed by combination of SO2 and NO2 with water in the atmosphere.
Radioactive materials	Present in wastes and (i) uranium and thorium mining and refining (ii) nuclear power plants and (ii) industrial, medical and scientific use

ON CONSUMING POLLUTED WATER FOLLOWING EFFECTS ARE OBSERVED HUMAN BEINGS.

Amoebic dysentery, Skin cancers, Cholera, Typhoid fever, Hepatitis, Malaria, Damage of nervous system, Genetic mutations/ birth defects,

ON PLANTS AND ANIMALS

Lower crop yields, Harmful to aquatic life and wild life, Excess growth of algae can kill aquatic life, Reduce Photosynthesis, Disrupts food chain and food web. A control measures for preventing water pollution

→ Setting up effluent treatment plans to treat waste.
→ Recycling of water must be encouraged.
→ Industrial wastes must be treated before discharge.
→ Educate Public for preventing water pollution and the consequences of water pollution
→ Strict enforcement of water pollution control act.
→ Continuous monitoring of water pollution at different places.
→ Developing economical method of water treatment
→ River, streams, lakes and other water reservoirs must be well protected from being polluted.

CONCLUSION

The role of every individual in preventing pollution is of paramount importance because if every individual contributes substantially the effect will be visible not only at the community, city, state or national level but also at the global level as environment has no boundaries. It is the responsibility of the human race which has occupied the commanding positions on this earth to protect the earth and provide conducive environment for itself an innumerable other species which evolved on this earth. A small effort made by each individual at his own place will have pronounced effect at the global level. It is appropriately said "Think globally act locally."Each individual should change his or her lifestyle in such a way as to reduce environmental pollution.

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7. A STUDY ON GREEN HRM PRACTICES IN AN ORGANIZATION

Dr.MU.ARUMUGAM, Assistant Professor in Economics, Sriram College of Arts &science, Perumalpattu, Tiruvallur.

Dr. C. VIJAI, Assistant professor in Commerce,Sriram College of Arts & Science, Perumalpattu, Tiruvallur.

ABSTRACT

Now a day, the go green policies are adopting in various environment management techniques. In India, the corporate world is going global; it's become essential to explore green practices in the business as well as in an environment. This study focuses on various green HRM practices followed in the organization. The paper largely focuses on the various green HRM practices and the relationship between corporate social responsibility and the green human resource management. And the study extended giving suggestions to the human resource department about initiatives to make the organization green and utilization from those values.

KEYWORDS: Green HRM, Environmental Sustainability, organization, green HRM practices

INTRODUCTION

Ecological imbalances and biodiversity issues are increasing day by day. Many scientists and researchers are discussing national issues like carbon credits, global warming and climate changes resulting into natural calamities and disasters in national and international conferences. Excess utilization of natural resources as raw materials by factories, industries and other commercial organizations has led to increase in environmental pollution and there is also huge pressure on these resources of our Earth to fulfill requirements of coming generations. In the light of these issues, companies are becoming aware of their responsibility towards the society
from where they get resources. The technical term for this is Corporate Social Responsibility. CSR in organizations is practiced by the HR department. One of the various methods to practice CSR in organization that is increasingly coming into focus is Environment Management / Green Management. The integration of green practices with HR policies for contributing in development of a culture of sustainability is called Green HRM. Further explained are some concepts of Green HRM.

OBJECTIVES OF THE STUDY

1.To know the concept of green HRM.
2.To understand that how Green HR policies and practices can improve the environmental performance of organizations.
3.To identify the green HRM practices for sustainable growth in the organization.

RESEARCH METHODOLOGY

In order to get Endeavour an emerging concept named Green HRM, a systematic literature has been done for the same. The data is collected from various research articles, whitepapers, magazines, project works & internet.

WHY GO GREEN

Nowadays, concern for environment has become the strategic issue that can compress the competition globally and hence going green is a means of attaining competitive advantage. The two main driving forces behind adoption of green concept in companies are saving resources/energy for sustainability and to fulfill the regulations laid by government. Going green involves adopting various changes in daily operations at every level in the organization leads to cost effectiveness and achieve competitive differentiation. The company with green image will be definitely paid through high returns as well as lower costs. Thus adopting green policy in organization is a strategic way of attaining competitive advantage as well as sustainability.

GREEN HUMAN RESOURCE MANAGEMENT (GHRM)

Green HRM involves undertaking environment friendly HR initiatives resulting in greater effectiveness, lower cost and better employee engagement and retention in turn. The green human resource management comprises of many functions in the human resource department of an organization. It helps to reduction of paper usage and the implementation of green human resource policies such as planning, recruiting, selecting, managing employees and the employee relations. It makes the environment green in the workplace. All the activities involved in the green human resource management enhance the value of the employees and the company.

NEED FOR GREEN HRM

Today the need for green human resource management is important for all over the world. The ecological consciousness of each

human drives the living style and environment. The general employees are interested in green human resource management because of its important and need in the current workplace. Our personal and professional lifestyle is affected due to many consequences. The corporate world is the most significant in enhancing the environment issues and the corporate has to give solution to this hazards.

GREEN HRM IS A PART OF CSR ACTIVITY

To implement any corporate environmental program, several units of an organization such as human resource, marketing, finance, operations are put together. But the major part lies to the human resource department as corporate social responsibility (CSR). Though the green HRM is the wider program of corporate social responsibility. In the organization, human resource and their systems are the basic foundation of any business. The green human resource management consists of two major parts of an organization.

Fig 1: Green HRM

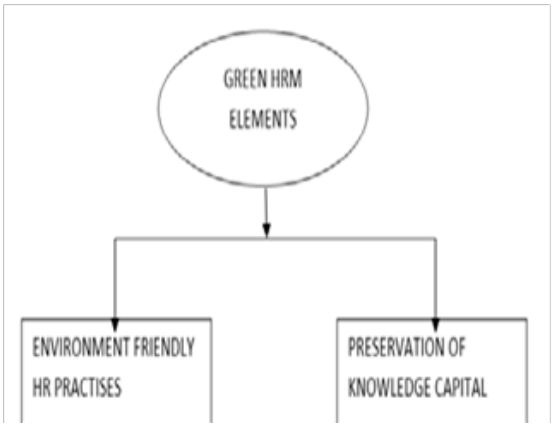

Fig 2: Green Human Resource Management Elements

The environment friendly human resource practices and preservation of knowledge capital is considered as green human resource management elements. Opatha, 2013; Opatha and Anton Arulrajah, 2014. Defines green HRM as transforming the usual employees to green employees to achieve the environmental organizational goal and as to solve the environmental issues. The green human resource management involves all the activities in the organization such as on-going maintenance that makes the employee green. Wehrmeyer 1996, Renwick et al, 2008 and 2013. States that the companies have introduced duties and responsibilities that incorporated environmental and social activities. Each employee will allot some duties relating to ecological protection wherever and whenever achievable.

GREEN PRACTICES

Renwick, Redman, and Maguire‟s (2008) introduce a comprehensive compartmentalization of Green HRM practices that can be clearly understood, starting at the point of an employee‟s organizational entry and proceed until the point of the employee‟s exit. To be ecological, economical and practical at the same time is possible through by adopting Green Practices. Here are some environmentally-friendly solutions to stay Green.

1. Green Printing
2. Green Manufacturing and Disposal of Staff ID card
3. Job sharing (sharing a full-time job between two employees)
4. Teleconferencing and virtual interviews
5. Recycling
6. Telecommuting
7. Online Training
8. Reduce employee carbon footprints by the likes of electronic filling, Green HR involves reducing carbon footprint via less printing of paper, video conferencing and interviews etc.
9. Energy efficient office spaces
10. Green Payroll
11. Car Pooling
12. Public Transport
13. Company Transport
14. Flexi-Work
15. e-filing

COMPONENTS OF GREEN HRM

→ Green recruitment
→ Green Selection
→ Green orientation
→ Green Training
→ Green performance

→ Green compensation and reward
→ Green counselling
→ Green welfare

GREEN RECRUITMENT

Now organisations are giving their advertisement through their web-site. This method is very fast ,cheap and easy to assess. Bauer & Aiman- Smith (1996) identified the impact of proenvironmental factor recruitment that employees are encouraged to work in a firm which promote green practices. Frank (2003) identified the relationship between perception of employee and ethics of company and found that employees are interested to work in eco-friendly Company.

GREEN SELECTION

Interviews are conducted by group discussion, personal interview, and different activities and in online test. Candidates could be given preferences who are more environment friendly for a organisation.

GREEN ORIENTATION

Induction and orientation programmes are framed in such a way that facilitates the new comers about green practices. Green issues like health and safety, use of material and cleanness of area in work place etc.

GREEN TRAINING

Training should be given on increase of green management. Trainer should give their training on presentation or by video conferencing. Trainer should use more soft materials rather than printed handouts to reduce the use of paper. Sarkaris (2010) suggested that employees presented better training on environmental training programme. Daily (2007) suggested Green training will help the employees to identify the challenges of green HR principles.

GREEN PERFORMANCE APPRAISAL

In performance appraisal use of green practice should be one of the key performances Area (KPA). Green performance appraisal motivates employees for use of green practices in organisation. Jabbar (2012) studied that human dimensions impacts the organisational performance as well as environmental management system or organisation.

GREEN COMPENSATION AND REWARD

Compensation and reward system should be directly linked to use of green skills. Special bonuses given to employees for their effort of less carbon foot print. Forman and Jorgensen (2001) suggested rewards help to improve employee commitment to environment management programmes.

GREEN COUNSELLING

Top level managers and counsellers can take initiative to motivate employees for implementation green practices and business sustainability.

GREEN WELFARE PRACTICES

Now a day's many organisations changed the concept of health, safety and welfare of employees to health, safety and environmental management. These companies have continuously giving their effort to reduce stress occupational disease and hazards at work place.

ADVANTAGES OR BENEFITS OF GREEN HRM

Green HRM has its prime importance in the achievement of broader objectives such as cost saving, corporate social responsibility, talent acquisition and management and gaining advantage over the competition. It further has the following benefits:

→ It increases employee morale.

→ It helps in employee retention and reduces labor turnover.

→ It provides lucrative opportunities for quality human talent.

→ It helps in building company image to attract good human resource.

→ Improves brand image of the company in the market.

→ It can also be used as a marketing strategy.

→ It improves the quality of the overall organization both internal and external.

→ It improves relationship of the company with its stakeholders- customers, suppliers, vendors, shareholders, government agencies, employees and the media.

→ It reduces the overall cost of the company as costs are largely influenced by the size of the company and steps taken to make it environment friendly.

→ It provides competitive advantage to the company in industry as well as the market.

→ With increasing global issues, many organizations are becoming vigilant of their activities and their impact over the environment.

→ Green management practices are also beneficial to the companies as it helps to save money and reduces ill- effects on the environment, hence avoiding much government interventions.

→ It stimulates innovation facilitating growth, improvement in quality and enhancement of procedures and methods.

→ It helps in efficient use of resources and manages risks more effectually.

→ It develops green learning environment in the organization.

CHALLENGES OR LIMITATIONS TO GREEN HRM

Apart from the above mentioned advantages or benefits, green HRM faces certain challenges. The challenges or limitations of Green HRM are as follows.

→ It is difficult to alter the behavior of employees in a short span of time.

→ Not every employee is equally motivated to participate in the promotion of Green HRM practices in the organization.

→ Developing the culture of Green HRM in entire organization is a cumbersome and lingering process.

→ It requires high investment at initial stage and comparatively slow rate of return.

→ Sourcing and recruitment of green employees with quality talents is a challenging task.

→ It is difficult to measure the effectiveness of green HR practices in employees' behavior.

→ HR professionals are faced with being expected to provide the essential green structures, green processes, green tools, and green thinking to make the best selection and develop the future green leaders of the organization.

CONCLUSION

Green HRM practices enable productive use of organization's space and infrastructure. It improves management and employees and employee- employee relationships by sharing of resources and responsibility to manage and develop green practices to inculcate courtesy of sustainability. It helps in minimizing environmental pollution by encouraging practices like car- pooling, video conferencing, e- recruitments, use of CFC- free air fresheners, recycling, online training programs, etc. Green HRM is not only a part of HRM but it provides a new dimension
to entire organization. Green HR efforts have most importantly focused on increasing KSA, cut down and knock out environmental havoc and restoring HR product tools and procedures. Environment friendly HR processes give better efficiency, minimize costs and manage to develop and nurture a culture of engaged employee helping organization to operate in a sustainable manner. To conclude, Green HRM is the need of the hour, requirement of this century to outlast in the contemporary biz world by having an edge over the competitors, developing distinct green image in the market, conforming corporate social responsibility and accomplishing the motives of being an entrepreneur by generation of employment opportunities for talented eco- friendly manpower.

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8. AIR POLLUTION IN INDIA – CAUSES, EFFECTS AND SOLUTIONS

K. R. DEVARAJ, M.A.,M.Phil., Part Time Ph.D Research Scholar, Arignar Anna Govt. Arts College, Cheyyar.

ABSTRACT

Air is the necessary for the very existence of human beings, animals and plants that appeared on the earth. However, due to the rapid growth of population and technology the air was polluted day by day. In 2011, India's Central Pollution Control Board had presented the report according to which 180 cities in India had particulate matter six times more than the permissible limit set by the World Health Organization in the air. Vehicles, biomass burning, fuel tarnishing are few of the major causes of air pollution in India. The problem of air pollution is so big that we cannot manage to pay for overlook it. As such it has to be handled with a high degree of care. This paper focuses on causes, effects of air pollutions in India and steps to solve the problems and policy measures to ensure reduce air pollution to the entire resident of earth. This study mainly descriptive in nature and secondary data are used for the purpose of the study. The data was collected from books, various articles, journals and websites.

KEYWORDS: Environmental Pollution, Air Pollution and Pollutants

INTRODUCTION

In the recent decades every man are should be fight every day against various environmental pollutions such as Air, Noise, Water, Land etc. Air is one of the five essentials for the human beings. Particularly men breathe nearly 22,000 times a day and in hale approximately 15 kg of air per day. Even though the air is abundantly available over the surface of earth, but it consist a lot of impurities. Various types of contaminants are entering into the atmosphere of the earth by natural and manmade activities, which are taking place on the earth.

CONCEPTS AND DEFINITION OF AIR POLLUTION

Air pollution can be defined as the presence of the contamination in the outdoor atmosphere in a sufficient quantity and duration to cause them to be injurious to human health and welfare and plant and animal life and to interfere with the enjoyment of life and property.

According to World Health Organization (WHO) Air Pollution is the outer atmosphere of substances or contaminants put there by man in quantities and concentrations and of a duration as to cause any discomfort to a substantial number of inhabitants of a district of which are injurious to public health or to human, plant or animal life or property or which interfere with the reasonable comfortable enjoyment of life and property throughout the state or throughout the territories or area of states.

SOURCES OF AIR POLLUTANTS

There are various pollutants interfere into the earth like various naturals and manmade activities such as dust storm, volcanic eruptions, industrial pollutions, etc. Based on the mode of generation of pollutants it as classified i) Natural Sources and ii) Man-made Sources.

NATURAL SOURCES OF POLLUTION

- Forest fires: is a common feature. Very large quantities of smoke and particulate matter are liberated during their breakout.
- Volcanic Eruptions: is produced along with release of minute solid particles, gases and radiation.
- Dust Storms: are caused due to the movement of hot winds around the earth and are concentrated in certain places at a particular time.
- Pollen Grains: is also caused by the production of pollens in the spring season. They are mainly responsible for causing for causing allergy.

MAN-MADE SOURCES OF POLLUTION

- ***Domestic Pollution***: is the use of insecticides in home for cleaning, burning of fuel in home for cooking purpose are primary sources of pollution in domestic area.
- ***Industrial Pollution:*** is the industrial activities are primarily responsible for the pollution in India. The elements are emitted into the atmosphere along with gaseous pollutants like Sulphur-di-oxide, oxide-of-nitrogen and standard particulate matter.
- ***Vehicular pollution:*** is the most dangerous form of pollution being prevalent in India because in spite of introducing stringent laws, adopting new standards, changing the fuel and modifying the design of vehicles studies reveal that it is increasing rapidly and continuously polluting the whole environment through which it is running.

AIR POLLUTION IN INDIA

In the Yale Environmental Performance Index by the Yale University, India ranked at 174th position out of 178 countries on air pollution. Only Pakistan, China, Nepal and Bangladesh have worst air quality than India as per the index. For indexing, air quality, water, sanitation and status of biodiversity have been taken into account. The overall rank of India is 155th, whereas most of the other BRICS countries are ahead of India on overall rating.

In 2011, India's Central Pollution Control Board had presented the report according to which 180 cities in India had particulate matter six times more than the permissible limit set by the World Health Organization in the air. Vehicles, biomass burning, fuel tarnishing are few of the major causes of air pollution in India. The problem of air pollution is so big that we cannot manage to pay for overlook it.

FACTS ABOUT AIR POLLUTION IN INDIA

India is the seventh most environmentally unsafe country in the world. Most of the industries do not stick to the environmental guidelines, regulations and laws. Pollution caused by burning fuel wood and biomass is one of the main causes of the Asian brown cloud. This cloud delays the monsoon in India.

Many auto rickshaws and taxis in India use contaminated fuel. This is done to lower down the price but it is the environment and ultimately we who have to pay the charge back. Some of the adulterants are actually very harmful to the environment as these emit unsafe pollutants which further worsen the quality of air.

As per the scientific studies it has been found out that traffic at low speed especially during obstruction burn fuel inadequately and emit 4 to 8 times more air pollutants. There are more than 40 different types of dangerous pollutants in the engine exhaust (diesel and gas). 70% of the air pollution is caused by vehicles.

Burning of vestige fuel such as coal and diesel has reduced the growth of rice harvest in India. India is the third largest producer of coal in the world and at the top as far as CO2 emitted was considered. 30% children in Bangalore suffer from Asthma due to air pollution. The city is also regarded as the asthma capital of India. In NDTV it has been shown that Delhi is the most polluted city in the world and it left behind Beijing in air pollution. Industrial and vehicular emissions have caused the pollution to rise at this level in Delhi. Each day 1,400 new vehicles are added to Delhi roads.

QUALITY OF AIR IN INDIA

In this section, we will assess the quality of air in India based on indicators like Household Air Quality and Outdoor Air Quality affected by Ozone, Nitrogen oxides (NOX), Sulphur-di-oxide (SO2) and Carbon monoxide (CO).

HOUSEHOLD AIR QUALITY

Indoor air pollution is among the top five environmental health risks. Household air pollution causes more deaths than outdoor i.e. 40% of all the diseases burden can be attributed to household air pollution. In 2012, indoor air pollution was linked to 4.3 million deaths globally, compared with 3.7 million for outdoor air pollution.

In India, too, the death due to indoor air pollution amounts to 300,000 to 400,000. Artemis hospital conducted a survey which found that 76% of the offices and houses in National Capital Region have unhealthy air quality and 34% of people staying indoors have respiratory problems. Solid fuels are the biggest contributor to the deterioration of household air quality. It is estimated that 25%-30% of primary particle pollution in India is from household fuels. Over one billion children live in homes where solid fuels are used in cooking and heating and in India, about 64% of the population use solid fuels with high production.

A study in Andhra Pradesh, India, found that solid fuel use created a mean 24 hour average concentration of particulate matter that ranged from 73 to 732 µg/m3. Guidelines from the WHO indicate that it shouldn't exceed 10 µg/m3.

OUTDOOR AIR QUALITY

Outdoor air pollution is also considered Group I carcinogen. The pollution is not only the national problem of India but also the problem of the whole of South Asia. India is surrounded by highly polluted neighboring countries like Pakistan, Bangladesh, China, Nepal, Tibet, Bhutan and Sri Lanka.

Sri Lanka has performed best in South Asia with the rank 108th in 2016 EPI. Around two billion children live in areas where outdoor air pollution exceeds international limits. Almost 300 million children live in areas where outdoor air pollution is toxic – exceeding six times the international limit.

World Health Organization reports are also suggest that urban outdoor air pollution has increased by about 8% between 2008 and 2013. It has also been found that in 2012, approximately around 127,000 children under the age of five died from outdoor air pollution, while 531,000 died from household air pollution. China and India have time and again been observed as areas where air pollution is at its worst. PM 2.5 and PM 10: On October 31, 2016, the day after Diwali, Delhi witnessed severe air pollution which was 14-16 times higher than the prescribed safety limit.

On the basis of the data retrieved from the Central Pollution Monitoring Agency, concentrations of particulate matter or PM 10 (coarser pollutants) was found to be around 1,600 micrograms per cubic metre against the safe level of 100 at around 2 am in Delhi's Anand Vihar and PM 2.5 was 14 times the safe limit.

In fact, according to the Ambient Air Pollution Database, WHO, May 2016, India had 13 cities in the world's top 20 most polluted cities with Delhi leading the pack along with Patna, Gwalior, and Raipur respectively. Of 1,215 most polluted cities recorded, 133 were Indian with 31 in top 100 most polluted cities.

Carbon emission: India has seen an increase of 137% in the carbon emission from 2001 to 2013 while China has observed an increase of 191%. Again from 2014-2016, carbon emission increased in India by 2%. Between 1971 and 2014, total CO2 emission in India has increased by more than 1100% with 181 million tons in 1971 to 2190 million tons in 2014. In 2014, carbon emission from India accounted for 6.78% of total global emission.

Nitrogen Oxides: From 1997 to 2011, NO2 emission in India increased by 28% while Nitrogen Use Efficiency decreased by almost 32%. Sulphur Dioxide (SO2): According to recent studies it was found that SO2 emission in India from 2005-2012 increased by 71% while the SO2 burden on the environment increased by 63%.

Effects of Air Pollution

- Air pollution causes irritation in the throat, nose, lungs and eyes. It causes breathing problems and aggravates existing health conditions such as emphysema and asthma.
- Polluted air reduces the body's defenses and decreases the body's capacity to fight other infections in the respiratory system.
- Polluted air increases the risk of cardiovascular disease. Breathing air that is filled with fine particulate matter can induce hardening of the arteries, triggering cardiac arrhythmia or even a heart attack.
- People who exercise outdoors are vulnerable to the adverse effects of air pollution because it involves deeper and quicker breathing.
- Acid rain contains hydrogen ions, which can damage trees, crops, harm marine animals and induce corrosion in metals.
- Smoke causes harmful health effects in humans and animals. It creates the black lung disease in dolphins of due to high concentrations of carbon particles in the air.
- People afflicted with heart disease, children and older people are more responsive to air pollution.

SOLUTIONS FOR AIR POLLUTION

The solutions to control of Air Pollution are discussed below:

- Renewable energy sources use like sunlight, wind, water, air, etc. is one of the best solutions for air pollution. It is produce energy without causing air pollution.
- We want to prevent air pollution we should protect our forests. We should also grow more and more trees. Also, reforestation and forestation should be encouraged.
- Using solar panels, solar cooker, solar lamps, lights, solar cars, batteries, inverter, energy collectors and similar other useful solar equipment can help prevent air pollution at a significant level because solar devices do not pollute the air.
- Sharing vehicles is also another option to control air pollution. Individual vehicle cause makes traffic and will pollute air.
- Using bicycles for short distances is also a wonderful and interesting way to control air pollution.
- Use of electric, hybrid and energy efficient vehicles as they produce zero direct emissions, thus, helping in the prevention of air pollution.
- Proper maintenance and servicing of vehicles helps in limiting excessive harmful emissions like carbon monoxide, nitrogen oxides, hydrocarbons, etc., from vehicles.
- Clean and efficient garbage disposable system should be arranged at various public places so that the garbage can be disposed in the right way.
- All of us can make individual efforts towards prevention of air pollution by replacing plastic bags with paper bags, plastic containers with steel or ceramic containers, plastic crockery with glass or steel crockery and similar other replacements.
- Efficient and appropriate measures should be taken to control dust emission during various activities like mining, building constructions, road constructions, etc. Dust particles add up to atmosphere and degrade the quality of air, causing air pollution.
- The environmental audits are done in an organized document form so that a track record can be established for necessary measures.
- Industries and factories should have internal environment audit and control systems so that the harmful emissions causing air pollution can be limited.
- Human-made products and handicraft items are environmental friendly and help control air pollution.

- Use unmodified vehicular fuels. With the rising price of petrol and diesel, many people have started using adulterated fuel.
- Creating awareness for air pollution is very necessary. If people stay aware about air pollution, its causes and dangerous effects, they will definitely make individual efforts to combat and prevent air pollution.

CONCLUSION

The earth is an important planet for all human, animal and plants. But human only destroying natural resources and creating problem of air pollution. Hence, it is our responsibilities to find out the problems and follow the measures to solving it. Let us take a pledge to grow trees more and more and to protect healthy environment. It is only the seeds of our coming healthy generation.

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9. PERSPECTIVE STUDY OF ENVIRONMENTAL EFFECTS ON PUBLIC HEALTH

Dr.M.MOHAN RAJU M.A.,Ph.D.,B.Ed., Assistant Professor of Economics, S.S.Government Arts College, Tiruthani -631209.

ABSTRACT

In this paper it is critically review the economic literature on the effects of environmental changes on public health ,in both the developed and the developing wolrd. The first focus on the economic methodologies that are available for the evaluation of the effects of environmental changes on public health .Then it explain how the monetary valuations of these effects can feed back in the construction of economic policy for creating agent specific incentives for more efficient public management,which is also equitable and environmentally sustainable. Every minute, five children in developing countries die from malaria or diarrhoea. Every hour, 100 children die as a result of exposure to indoor smoke from solid fuels. Every day, nearly 1,800 people in developing cities die as a result of exposure to urban air pollution. Every month, nearly 19,000 people in developing countries die from unintentional poisonings.

INTRODUCTION

The environment affects our health in a variety of ways. The interaction between human health and the environment has been extensively studied and environmental risks have been proven to significantly impact human health directly by exposing people to harmful agents by disrupting life-sustaining ecosystems . Although the exact contribution of environmental factors to the development of death and disease cannot be precisely determined, the World Health Organization (WHO) has estimated that thirteen million deaths annually are attributable to preventable environmental causes. The report also estimates that 24% of the global disease burden (healthy life years lost) and 23% of all deaths (premature mortality) are attributable to environmental factors, with the environmental burden of diseases being 15 times higher in developing countries than in developed countries, due to differences in exposure to environmental risks and access to health care.

The huge economic development and population growth result in continuing environmental degradation. Intensification of agriculture, industrialization and increasing energy use are the severe driving forces of environmental health problems. For countries in the early stages of development the major environmental hazards to health are associated with widespread poverty and severe lack of public infrastructure, such as access to drinking water, sanitation, and lack of health care as well as emerging problems of industrial pollution. The Occurrences of Asthma are rising dramatically throughout the developed countries, and environmental factors appear to be at least partly to blame . The Millennium Ecosystem Assessment synthesis report warns that the erosion of ecosystems could lead to an increase in existing diseases such as malaria and cholera, as well as a rising risk of new diseases emerging.

Climate change is also posing risks to human population health and well-being and thus is emerging as a serious concern worldwide [3–6]. In 2000 climate change was estimated to be responsible for approximately 2.4% of worldwide diarrhoea and 6% of malaria . According to the IPCC third assessment report the world temperature is expected to further rise during the century, implying increased health threats for human populations, especially in low-income countries. A study in Mexico revealed that lower greenhouse gases emissions would result in avoidance of some 64,000 premature deaths over a twenty year period.

ECONOMIC VALUATION TECHNIQUES

The impacts of environmental degradation on human health is essential for the development of well-informed policies by the health sector and consequently many valuation studies have been conducted worldwide the past decades addressing environmental risks to public health. The main approaches for health impact valuations can be broadly classified into revealed and stated preference techniques. The first take into account observable market information which can be adjusted and used for revealing an individual's valuation. Revealed preferences include cost of illness, human capital surveys, hedonic pricing and the Quality Adjusted Life Year studies. In stated preferences studies the market for the good is 'constructed' through the use of questionnaires. The two most-well-known stated preference methods are the Contingent Valuation Method (CVM) and the Choice Experiments (CE).

The Quality Adjusted Life Year (QALY) studies measure both the quality and quantity of life. The values for a Life Year range from 0, implying death, to 1, implying a year of perfect health.

Therefore, QALYs provide an indication of the benefits from a healthcare intervention in terms of health-related quality. Combined with the costs of providing different interventions, a cost-effectiveness analysis (cost per QALY) can follow to allow for comparisons of different interventions. A monetary value can also be placed on a QALY to estimate the dollar benefits of a health intervention or policy and allow for a subsequent cost-benefit analysis. Stated Willingness to Pay, elicited through a contingent valuation study or a discrete choice study, is often used, to monetize QALYs. Other methods to value a QALY include time-trade-offs, standard gamble and the visual analogue scale. Hedonic pricing methods assess differences in the price of housing in polluted or unpolluted areas, or the difference in wages between hazardous and non-hazardous jobs. Variations in housing prices and wages reflect the value of health damages avoided to those individuals and therefore reveal individual's willingness to pay to avoid damages.

ECONOMIC ASSESSMENT OF ENVIRONMENTAL HEALTH IMPACTS: EMPIRICAL EVIDENCE

There is increasing recognition that linked environment and health impacts require economic assessment in order to receive adequate consideration in policy. Consequently, a huge increase in the number of valuation studies trying to quantify the environmental impacts on human health in monetary terms and evoke public preferences for health and environmental policies that reduce the risk of illness or mortality has been experienced in recent years.In the subsequent sections important applications of the valuation techniques that have been conducted to estimate the social benefits associated with increased air and water quality dislike of climate change are reviewed.

AIR QUALITY

Air pollution is a major environmental risk to health and is estimated to cause approximately two million premature deaths worldwide per year [7] A reduction of air pollution is expected to reduce the global burden of disease from respiratory infections, heart disease, and lung cancer. As air quality is a major concern for both developed and developing countries, a large number of empirical studies attempting to monetize the benefits to health generated by improved air quality have appeared in the literature worldwide. Pearce [8] provides a summary of the main studies conducted to that day valuing health damages from air pollution in the developing world. In particular, valuation estimates for health symptoms and risks of mortality attributable to particulate matter, lead, nitrogen and sulphur oxides and low level ozone are reported. The main conclusion from the literature review is that some forms of air pollution, notably inhalable particulate matter and ambient lead, are serious matters for concern in the developing world since they are associated with severe health damages in monetary terms.

Since then a number of valuation studies have been conducted in developing countries estimating social benefits from air pollution reduction in terms of either averted mortality or averted morbidity due to air pollution mitigation strategies. To provide economic estimations of health risk reductions authors rely on existing epidemiological studies that establish the relationship between pollution concentrations and health hazards. Valuation studies are then conducted to monetize health outcomes given the number of exposures and the associated risk predicted from the dose-response functions.

WATER QUALITY

Contact with unsafe drinking or bathing water can impose serious risks to human health. Microbe contamination of groundwater due to sewage outfalls and high concentration of nutrients in marine and coastal waters due to agricultural runoff are among the most serious threats . According to the European Commission's (EC) recent statistics, 20 percent of all surface water in the EU is seriously threatened by pollution. In the infrastructurally disadvantaged developing world the water contamination problem is even more prominent.Although epidemiological studies have provided evidence of severe morbidity attributed to polluted water the issue has received limited attention in terms of valuation studies. Only few studies explicitly address health effects of drinking and bathing water quality to inform efficient water resources management policies mainly in high income countries.

In the developing world, health damages from drinking water contamination are examined by Dasgupta and Maddison et al. The former study estimates a health production function to derive the total cost of illness related to Diarrhoeal diseases in urban India,. Annual health costs are calculated and aggregated over the whole population are found to equal € 2,821,587. The latter estimates aggregate willingness to pay to avoid health risks, including various cancers, associated with consumption of arsenic contaminated groundwater in Bangladesh. Based on Value of Statistical Life estimation from studies in

India, authors report an aggregate WTP of $2.7 billion annually to avoid mortality and morbidity cases.

CLIMATE CHANGE

An understanding of the likely impacts of climate change on human welfare is crucial for making an informed decision about the best response strategy to the enhanced greenhouse effect. Consequently, a number of studies have attempted the evaluation of climate change-related health hazards.However the studies provide a total cost estimation of the climate change in $ per tonne of carbon and health effects are not distinguished. Based on the existing literature, Tol concludes that policy response to climate change should be dominated by adaptation, not by mitigation.

Welfare losses associated with health impacts induced by global warming are also estimated by Bosello et al.. Authors apply a general equilibrium macroeconomic model to infer costs estimates relating to cardiovascular and respiratory disorders, diarrhoea, malaria, dengue fever and schistosomiasis occurrences through changes in labour productivity and demand for health care. Consistent with the literature, results imply the welfare costs (or benefits) of health impacts contribute substantially to the total costs of climate change both in terms of GDP and investment.

Health effects from illnesses associated with climate change are also examined in the developing world by Tseng et al. using the dengue fever in Taiwan as a case study. The relationship between climate conditions and the number of people infected by dengue fever was first established and the monetary assessment was then attempted applying a contingent valuation study. Results indicate that people would pay € 15.78, € 70.35 and € 111.62 per year in order to reduce the probabilities of dengue fever inflection by 12%, 43%, and 87%, respectively.

THE USE OF VALUATION RESULTS IN POLICY DESIGN

Climate change and anthropogenic forcing threaten environmental stability and with it ecosystems' capacity to provide goods and services that can be translated to economic benefits for humans including values associated with health quality and death mitigation. Although environmental goods and services have value to society, are often neglected in policy-making as they are not traded in markets and as such are not priced. A primary cause for environmental degradation and consequent health hazards is failure to identify and internalize in decision-making the economic value of ecosystems. In the absence of markets, valuation studies can provide policy-makers with the necessary information to acknowledge the contribution of health benefits in the social welfare associated with environmental resources justifying the need for policy intervention to eliminate health effects from environmental hazards. Once aggregated over the full range of beneficiaries, monetary benefits estimated through valuation studies can be compared with the costs of the relevant environmental or health intervention policies through cost-benefit analysis to derive useful information on the efficiency of the planned policy. Welfare changes from alternative policy initiatives can be also assessed and the impact of social, economic and attitudinal characteristics on individual valuation can be examined. In this respect, valuation studies are significant for policy-making to guide the selection of economic instruments to allocate resources among socially valuable endeavours

CONCLUDING REMARKS

Environmental degradation poses a significant threat to human health worldwide. Because environment and health are so intimately linked for the environmental and health policies. However, health impacts are non-marketed and thus hard to quantify in monetary terms. The subsequent risk of being ignored in policy-making is a major concern worldwide. To address this challenge a number of valuation studies have been conducted in both developing and developed countries applying different methods to capture health benefits from improved environmental quality. Valuation results are crucial for the formulation of economic instruments to internalize the externalities created by the public nature of environmental resources. Enhancing air quality and securing adequate supplies of safe drinking water is associated with significant benefits for human health and well-being. Significant benefits are also found to be associated with bathing water quality socially justifying the costs for abatement policies. Climate change effects mitigation is also of great importance in terms of public health benefits. However, certain limitations of the existing literature have been identified.Further to provide accurate monetary estimates of the benefits of reduced health symptoms associated with environmental hazards, collaboration between economists and epidemiologists should be further enhanced to establish more informed dose-response functions and accordingly formulate the valuation scenarios. Finally, since health benefits from environmental improvements accrue in the long run their assessment should recognize their long-run nature.

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10. ENERGY RESOURCES AND ITS PRESENT USE IN INDIA

S.MANJULA, Assistant Professor, Department Of Economics, D.g.govt.arts College For Women, Mayiladuthurai. Mobile No: 9840910296, E-Mail Id: Smanju79@Rediffmail.com.

ABSTRACT

Energy is an essential ingredient for human life on earth. It is used in all activities of society, for preparing meals, making cloth, building house, industries and other activities. Human beings require energy at an increasing rate for their sustenance and well-being. The present study is an attempt to understand the details with types of energy use in India. The largest energy source is coal, followed by petroleum and traditional biomass. According to the 2011 Census, the household-level data indicates that only 55.3 per cent of rural homes used electricity as the primary source for lighting. Energy access, with about one fourth of the population lacking access to electricity and energy security, with the country relying on imports for a considerable amount of its energy use, particularly for crude petroleum are key challenges that the country faces with respect to energy. Wide disparity in energy use pattern between the haves and have-nots, urban and rural are also a cause of concern.

KEYWORDS: Energy, Human being, Sources of Energy, Uses of Energy.

INTRODUCTION

Energy is required for every aspect of our daily life. The requirement of energy has gone up in the last few years and would touch unimaginable proportions because of population explosion and improved living standards in our country. In rural India, people once used cow dung and wood for their energy needs. With better economic conditions, more and more people are using cleaner and more convenient forms of energy viz. electricity and gas for home usage. The availability of both these forms of energy is limited. The shortage results in frequent power breakdowns, disrupts daily life, causes manpower loss in offices and adversely affects the industrial production and thereby the economy.

Energy is the capacity to do work and overcome resistance. Its unit is Joule. Heat, light and electricity possess the capacity to do work. They provide what are called heat energy, light energy and electric energy. Mechanical energy, heat energy, light energy, sound energy, electrical energy, chemical energy and atomic energy are different forms of energy. Mechanical energy can be classified as potential energy and kinetic energy.

Energy is an essential input and a basic requirement for oiling the wheels of production and has manifold applications in domestic, social and economic activities. As Schumacher says, "There is no substitute for energy; the whole edifice of modern life is built upon it. Although energy can be bought and sold like any other commodity, it is not 'just another commodity', but the pre-condition of all commodities, a basic factor that is equal to water and earth". Energy is an important input in all sectors of the economy of any country. The standard of living of a given country can be directly related to per capita energy consumption. Presently, energy crisis has become the major concern all over the world because of two reasons. The first, the population of the world has increased rapidly and the second, the standard of living of human beings has increased. The per capita energy consumption is a measure of the prosperity of the nation.

OBJECTIVES OF THE STUDY

1.To understand the present pattern energy use in India.

2.To identify the production of commercial sources of energy.

3.To know the availability of energy resources in India.

METHODOLOGY

This study is based on secondary data which is collected from the Directorate of Economics and Statistics, published reports of news paper, journals, websites, etc.

PRESENT STATUS OF ENERGY RESOURCES USE IN INDIA

In India, of the 121 crore Indians, 83.3 crore live in rural areas while 37.7 crore stay in urban areas. Energy availability, access and affordability are vital if our country is to keep its pace of development. As on 30.11.2017, electrification in 3,269 census villages has been reported as unelectrified. Among them, 1,052 villages have been reported un-inhabited. Remaining 2,217 villages are expected to be electrified by 1st May 2018. These 2217 villages are located in the State of Arunachal Pradesh (1069), Assam (214), Bihar (111), Chhattisgarh (176), J&K (99), Jharkhand (176), Karnataka (8), Madhya Pradesh (34), Manipur (54), Meghalaya (50), Mizoram (11), Odisha (182) and Uttarakhand (33)21% of our villages and about 50% of rural households are as yet not

electrified. It is targeted to achieve universal household electrification in the country by 31st March 2019.

During 2015-16, the per capita energy consumption in India is 1075 kilowatt-hour (Kwh). According to the official data the total installed capacity of the country stood at 315426.32 MW, as on February 28, 2017. Thermal power plants constitute 68.2 % of the installed capacity and hydropower about 14. There are 21 nuclear power reactors in the country with a total installed capacity of 5780 MW.

The peak power deficit was 1.6 % during 2016-2017 as against 3.2% last year. As on March 2017, 99.20 percentages of villages (ie. 5, 92,972) were electrified. India's per capita electricity consumption is 1075 kWh in 2015-16.

There is a wide disparity in the per capita energy consumption pattern between rural and urban areas. As per NSSO 68th round data, 67.3% of rural households depend on firewood for cooking and about 15% on LPG as against 14% of urban households depend on firewood for cooking and about 68.4% on LPG. Similarly for home lighting, while 26.5% of rural households depend on kerosene and 72.7% depend on electricity, 96.1% of urban households depend on electricity and 3.2% on kerosene. However, the number of LPG connections in the country has been increasing and as on 1.11. 2017, the LPG penetration in the country stands at 78.3%.

Women spend up to four hours of their productive time of a day in fetching fuel wood and cooking. Children too are involved in collection of fuel wood. A significant amount of rural energy used is derived from biomass. This puts heavy pressure on the already declining vegetation in villages. Use of inefficient chulhas often increases the drudgery of women and children who are involved in collection of fuel wood. Moreover, the smoke generated during indoor cooking from these chulhas affects the respiratory health of women and children to a great extent.

Increased energy conservation, improved energy efficiency and enhanced energy production from renewable sources can definitely lead India in general and rural areas in particular to become self sustainable communities.

PRODUCTION OF COMMERCIAL SOURCES OF ENERGY

Production of Coal, lignite, crude petroleum, natural gas & electricity:

- Coal production in the country during the year 2015-16 was 639.23 million tones (MTs) as compared to 609.18 MTs during 2014-15, registering a growth of 4.93%.
- The Lignite production during 2015-16 was 43.84 million tones which is 9.18% lower than the production during 2014-15 (48.27 million tons).
- Considering the trend of production from 2006-07 to 2015-16, it is observed that coal production in India was about 430.83 MTs during 2006-07, which increased to 639.23 MTs during 2015-16 with a CAGR of 4.02%.
- During the same period, the CAGR of Lignite was about 3.43% with production increasing from 31.29 MTs in 2006-07 to 43.84 MTs in 2015-16.
- Production of crude petroleum increased from 33.99 MTs during 2006-07 to 36.95 MTs during 2015-16, a CAGR of about 0.84%.
- The CAGRs for natural gas and electricity were 0.16% and 4.68% respectively for the period 2006-07 to 2015-16. Electricity has experienced the highest CAGR i.e. 4.68% among all the commercial sources of energy since 2006-07 to 2015-16.

AVAILABILITY OF ENERGY RESOURCES IN INDIA

I) ***Availability of Coal and Lignite***

→ The total availability of raw coal in India in 2015-16 stood at 843.27 MTs and that of lignite at 45.47 MTs.

→ The availability of coal in the year 2015-16 increased by 1.60% compared to 2014-15. The availability of lignite decreased by 8.27% during the same period.

→ The availability of coal has increased at a CAGR of about 5.74% during the period from 2006-07 to 2015-16. This increased availability might be attributed to the increase in the coal production (482.37 MTs during 2006-07 to 843.27 MTs during 2015-16) supplemented by imports.

→ The availability of lignite has increased at a CAGR of about 3.65% during the period from 2006-07 to 2015-16.

II) ***Availability of Natural Gas***

→ The production of natural gas has steadily increased from a mere 37.60 BCM during 2006-07 to 48.83 BCMs during 2015-16, registering a CAGR of 2.65%. Most of this increase in the indigenous production is due to discovery of new reserves.

III) ***Availability of Crude Oil and Petroleum Products***

→ The availability of crude oil in the country increased from 145.49 MTs in 2006-07 to 239.80 MTs during 2015-16.

→ During this period, crude oil production

increased from 33.99 MTs to 36.95 MTs and the net import increased from 111.50 MTs to 202.85 MTs between 2006-07 and 2015-16. There was increase of 5.69% in availability of crude oil during 2015- 16 over 2014-15.

IV) ***Availability of Electricity***

→ Electricity available for supply increased from 6, 39,008 kwh in 2006-07 to 11, 04,228 kwh in 2015-16, thus recording a CAGR of 5.62% during this period. The availability of electricity increased at 4.73% in 2015-16 over its value in 2014- 15.

CONCLUSION

This study reveals to know about the uses of energy, Production of commercial sources of energy and availability of energy resources in India.

- Energy is the capacity to do work. Energy comes in various forms, such as motion, heat, light, electrical, chemical, nuclear energy, and gravitational. Total energy is the sum of all forms of the energy a system possesses.
- The internal energy of a system is made up of sensible, latent, chemical and nuclear energies. The sensible internal energy is due to translational, rotational, and vibration effects of atoms and molecules.
- Coals are sedimentary rocks containing combustible and incombustible matters as well as water. Coal has impurities like sulfur and nitrogen and when it burns the released impurities can combine with water vapor in the air to form droplets that fall to earth as weak forms of sulfuric and nitric acid as acid rain.
- Petroleum oil is a naturally occurring flammable liquid consisting of a complex mixture of hydrocarbons of various molecular weights, which define its physical and chemical properties, like heating value, color, and viscosity.
- Natural gas is a naturally occurring mixture, consisting mainly of methane.

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11. AN ENVIRONMENTAL STUDY ON PROBLEMS FACED BY HEALTHCARE VISITORS OF KANCHIPURAM DISTRICT

Dr.N.PALANIRAJ, Head & Associate Professor, PG & Research Department of Economics, Pachaiyappa's College for Men, Kanchipuram – 631 502.

PRAKASH V, Ph.D Research Scholar, PG & Research Department of Economics, Pachaiyappa's College for Men, Kanchipuram – 631 502.

ABSTRACT

India as a developing economy is healthier nation because of proper and well-developed healthcare infrastructure. This leads to improvement in the life years and happiness of the population. The high life style increases the unhealthy practices of eating culture, fast food, no exercise and other. Even children's are facing serious health issues in early ages. Due to this, every individual's visiting the hospitals at least once in a month. Many get diseases while visiting hospitals where there is poor maintenance of various wastes, which leads to air pollution, waste water pollution, bio medical waste pollution, and soil pollution. Tamil nadu serve as a hub of medical services in India which also spreads to major hospital accrued infections to human beings as well as to the environment. This research study highlights about the environmental problems which are posed by the health care centers to the humans and animals.

KEYWORDS: hospital waste ,environmental pollution, bio medical waste

INTRODUCTION

Health care waste is any waste, generated during the diagnosis, treatment or immunisation of human beings or animals. These wastes are also generated during research activities or in the production or testing of biological materials. The solid or liquid waste arising from health care including collected gaseous waste. The wastes which are disposed and/or originated from any private and public healthcare institutions, can affect human well being and health, and the environment i.e., air, water, soil, animals, landscape, and also the public order and security. Health care waste includes all types of waste generated by health care establishments, research facilities, and laboratories.

75 per cent to 90 per cent of wastes produced by the health care establishments are general or non-risk wastes comparable to domestic wastes. These wastes come mostly from the administrative and housekeeping functions of healthcare centres and may also include wastes generated during maintenance of healthcare premises. The remaining 10-25% of wastes is regarded as hazardous and may pose a variety of health risks. The remaining 10-25% is hazardous and can be injurious to humans and animals and dangerous to the environment (Rao, 2004).

Table 1. Approximate percentage of waste type per total waste

Non-infectious waste	80%
Pathological waste and infectious waste	15 %
Sharps waste	1 %
Chemical or pharmaceutical waste	3%
Pressurises cylinders, broken thermometers..	Less than 1 %

RESEARCH PROBLEM

India has World's second highest population, next to China, having 127 crores of population with increasing number of health care facilities, silently producing thousands of tons of medical wastes everyday such as pathological wastes, blood wastes, etc. These health care wastes are highly infectious to those who handle it, may be doctors, nurses and other health care related people. The danger is really fall on the public who are using the healthcare facilities like Hospitals, Dispensaries, Labs, PHCs, CHS have the potential source to infect via these hospital wastes. This study aims to understand the different environmental problems and impact on human health of the same.

LITERATURE REVIEW

Ramesh Babu B (2009) studied with the objective to highlight the effect of hospital waste in the environment including air, land, and radioactive pollution. Air pollution in indoor chemicals from poor ventilator causes diseases like Sick Building Syndrome (SBS); in outdoor pollution, waste without pre-treatment, if it is dumped in open area will enter into the atmosphere. The Air Atmosphere too gets contaminated, causes respiratory diseases. Some radioactive effects also disturb the health of the environment. The liquid waste which let into water bodies

can alter the parameters such as pH, BOD, COD, etc., and in some cases the dioxin mix is also reported near incineration. Land gets polluted due to infectious waste, discarded medicine, chemical, lead and mercury which gets absorbed with water, water bodies, which will enter in food chain.

Hospital Pollution

An undisclosed study says, the infectious hospital waste may contain variety of pathogenic microorganisms. These may enter human body through puncture or cut in the skin, mucous membranes or by inhalation. Sharps are very dangerous because it can infect the wounds more. It has the dual risk of injury and disease transmission. The poor hospital waste management may lead to the cause of Hepatitis B and C, HIV infection, Gastro-enteric infection, skin infection, respiratory infection, blood stream infection, and radioactive toxicity and health problems associated with air and water pollution.

Table 2. The types of infections, determined by the contact with biomedical waste, pathogen agents and transmission

Infection Type	Pathogen Agents	Transmission Path
Gastrointestinal infections	Enterobacteria: Salmonell, Shigella spp. Vibrio cholera Helminthis	Faeces or/and vomiting liquid
Respiratory infections	Mycobacterium tuberculosis Measles virus Streptococcus pneumonae	Respiratory secretions, saliva
Eye infections	Herpes virus	Eye secretions
Genital infections	Neisseria gonorrhoeae	
Herpes virus	Genital secretions	
Skin infections	Streptococcus spp	Purulent secretions
Anthrax	Bacillus anthracis	Secretion of skin lesions
Meningitis	Neisseria meningitides	LCR
AIDS	HIV	Blood, semen, vaginal secretions
Haemorrhagic fevers	Junin Viruses, Lassa, Ebola Marburg	Biological fluids and secretions
Septicaemia	Staphylococcus ssp	Blood
Viral Hepatitis type A	VHA	Faeces
Viral Hepatitis type B and C	VHB, VHC	Blood, biological fluids

Source: Nikos, 2011

Hospital waste was not being managed but it was simply 'disposed off'. The disposal of hospital waste can be very hazardous particularly when it gets mixed with municipal solid waste. All the waste dumped in uncontrolled or illegal landfills such as vacant lots in neighbouring residential areas, inhabited lands and slums.

Further, unhygienic conditions in general ward toilets, coupled with frequent strikes by Class IV staff creates what are virtually secondary foci of infectious diseases within the hospital premises. Such areas are often stockpiles of heterogeneous infectious material and contribute greatly to the incidence of nosocomial infections. For example, according to a WHO report the excreted loads of some selected enteric diseases are as follows:

Table 3 Excreted loads of Infectious Agents

INFECTIOUS AGENT	AVERAGE NO. PER GRAM FECES
Shigella spp.	107
Salmonella typhi	108
Escherichia coli (pathological)	108
Hepatitis A virus	106
Source: Saurabh Sikka 2000	

The persistence of these organisms in the environment at 20-30o C is shown to variations from 2 weeks to a month. This aggravates health hazards when associated with the biomedical wastes generated in the hospitals. Bio-medical waste are being buried in small pits near the centres itself and gets exposed when stray dogs and pigs dig it out in search of food. The well defined and documented evidence is that, in developing countries, the impact of miss-managed health care wastes are transmitting hepatitis B and C, the HIV viruses through injuries by needles & syringes which are contaminated with human blood.

BEDS AND MATTRESSES

Hospitals have more beds; a single bed is used for different types of patients in the hospitals. Some mattress can absorb the infections and blood or any other secretion of human. Soiled linen and mattresses may contain pathogenic microorganisms from one diseased person which can be easily transferred to the other patients using it.

HOSPITAL PREMISES

Akter et al., (1998) reported that, there were several incidences (10 cases out of 17) of injury due to exposure to medical wastes inside or outside the hospital premises. These were as follows:

•Hands cut due to handling broken glass
•Injured by needle and fingers permanently damaged/ became cured
•Right hand became paralysed by the injury by a needle
•Two legs became paralyzed due to injury by a needle
•Skin diseases on legs and hands/ body
•Pus due to injury sometimes
•Ulcer on legs

INJECTIONS

The greatest risks possessed by infectious waste are accidental needle stick injuries, which can cause Hepatitis B and Hepatitis C and HIV infection. There are numerous other diseases which could be transmitted by contact with infectious health care workers. A report on injection practices in India, submitted to the Ministry of Health, shows that two-thirds of the injections administered are unsafe. It is estimated that 0.6 to 0.8 million needle stick injuries are annually among heath care workers. The needle stick injuries have been related to certain work practices like:

•Recapping,
•Transferring of sharps between hands,
•Failing to properly dispose of sharps in puncture proof containers.

DIOXIN

The term "dioxin" is to refers both polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans, a family of 210 highly toxic and persistent chemicals that are unintentional by products of medical waste incineration and PVC plastic production. Health effects of dioxin exposure at even in extremely low concentration includes the following:

•Chronic lymphocytic leukemia, soft-tissue sarcoma, non-Hodgkin's lymphoma, and Hodgkin's disease have been linked to dioxin exposure. There are further more evidence of a possible association with liver, lung, stomach and prostrate cancers.
•Immune system effect and low exposures to dioxins result in susceptibility to bacterial, viral and parasitic diseases.
•Reproductive and Developmental effects in animals, decreased fertility, decreased litter size and inability to carry pregnancies.

CHEMICAL WASTE

These hospital wastes cause poisoning by absorption through the skin or mucous membranes, by inhalation or by ingestion. Chemicals and pharmaceuticals may also determine lesions of skin, eye, and respiratory mucosa. Chemical waste removed by drainage system may have toxic effects on ecosystems and water where are discharged.

ACID GASES

The acid gases (e.g., hydrogen chloride, nitrogen oxides and sulphur dioxides), cause acute effects such as eyes and respiratory irritation, can contribute to acid rain and may enhance the toxic effects to heavy metals. Particulate matter can cause chronic health effects. Burning of chlorine made material e.g., PVC, creates dioxin, a known animal carcinogen, and considered as human carcinogen. A lack of understanding of the modes of transmission of agents associated with blood borne diseases, the fear of a fatal disease such as the Acquired Immuno Deficiency Syndrome (AIDS), and a distrust of health care facilities and often misleading media coverage has led to intense public pressure on politicians to regulate medical waste.

ENVIRONMENTAL PROBLEMS

The improper management in bio-medical waste causes environmental problems that causes air, water and land pollution.

Air pollution can be in both indoor and outdoor atmosphere. Biomedical waste that generated by air pollution can been classified in to three types namely – Biological, chemical and radioactive. Pathogens present in the biomedical waste can enter and remain in the air for a long period in the form of spores or as pathogens. The indoor air pollution caused due to the chemicals from poor ventilation can cause diseases like Sick Building Syndrome (SBS). Most Chemicals utilized are not as per prescribed norms and over use of chemicals should be avoided.

Outdoor air pollution can be caused by pathogens. The bio-medical waste without pre-treatment if transported outside the HCF, or if it is dumped in open areas and roads, pathogens can enter into the atmosphere. Chemical pollution that causes outdoor air pollution has two major sources: open burning and incinerators. Open burning of bio-medical waste is the most harmful practice. When inhaled can cause respiratory problems.

Water Pollution, The liquid waste generated, let into sewers can lead to water pollution, without treatment or proper treatment. Water pollution can alter parameters such as pH, BOD, DO, COD, etc. There are instances where dioxins are reported from water bodies near incinerator plants. Dioxins can enter the water body from air and water.

Radioactive waste in liquid form can come from chemical or biological research, body organ

imaging, decontamination of radioactive pills, patient's urine and from scintillation liquids used in radio immunoassay. Research and radio-immunoassay activities may generate small radioactive gas.

Soil pollution of bio-medical waste is caused due to infectious waste, discarded medicines, chemicals used in treatment, ash and other waste generated during treatment processes. Heavy metals such as cadmium, lead, mercury etc., which are present in the waste, gets absorbed by plants and its entering into the human body through the food chain. Nitrates and phosphates present in the leachates from landfills are also pollutants. Excessive amount of trace nutrients element including heavy metals in soil are harmful to crops and are also harmful to animals and human beings. The WHO reveals that more than 50,000 people die every day from infectious diseases. HIV, hepatitis, tuberculosis, pneumonia, tetanus, and whooping cough are the diseases those spread through improper waste management.

SUMMARY

The following are the summary of environmental impacts associated with the improper care of hospitals:

- Pollutants from medical waste (e.g., heavy metals and PCBs) are persistent in the environment
- Ground water contamination, decrease in water quality
- Pathogens leads to long term accumulation of toxic substances in the soil, Specimens collected for analysis have the potential to cause diseases and illness in man, either through direct contact or indirectly by contamination of soil, ground water, surface water, and air.
- With domestic animals being allowed to graze in open dumps, there is the added risk of reintroducing pathogenic microorganisms into the food chain
- Public nuisance (e.g., odors, scenic view, block the walkway, aesthetics, etc.,)
- Improper sterilization of instruments used in labour room may cause infection both to mother and child

Inadequate hospital management thus will cause environmental pollution, unpleasant smell, growth and multiplication of vectors like insects, rodents and worms and may lead to the transmission of diseases like typhoid, cholera, hepatitis and AIDS through injuries from needles and syringes contaminated with human bloods. Various communication diseases which spread through water, sweat, blood, body fluids and contaminated organs, are important to be prevented.

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12. ECONOMICS AND AIR POLLUTION- AN ANALYSIS OF CHENNAI CITY

Dr. PREETHI MOHAN.M, Assistant Professor, Department of Economics, Bharathi Womens College, Chennai.

ABSTRACT

Air pollution causes a variety of environmental effects, besides harming human health. Acid rain is precipitation containing harmful amounts of nitric and sulfuric acids. These acids are formed primarily by nitrogen oxides and sulfur oxides released into the atmosphere when fossil fuels are burned. In the economics of pollution, we see that there is a point where both society and the environment have some satisfaction, or in other words, there is an optimum amount of pollution. The optimum amount of pollution can be defined as the point where the marginal benefit equals the marginal cost of pollution. Air pollution is responsible for major harmful effects on human health, animal lives, natural ecosystems and the man-made environment. It is also responsible for climate change due to the enhanced greenhouse effect, acid rain, and the depletion of the ozone layer that constitute important global environmental problems.

The relationship between environmental degradation and economic growth has been object of constant debate among environmental economists. During the last two decades, the debate between economic growth and the environment introduced into the discussion. External effects or externality is one of the most basic concepts evoked by economists when looking at problems of environmental pollution. The market impacts of outdoor air pollution are projected to lead to global economic costs that gradually increase to 1% of global GDP by 2060. Costs related to additional health expenditures and labour productivity losses dominate in the long run.

From an economics perspective, demand law suggests an inverse relationship between price and the quantity consumed of a marketable product. However, when a product does not have a very well-established market, this product will be most likely underpriced. This is the case of natural systems such as air or water. The lack of property rights for these natural inputs and the absence of environmental regulation or legal protection to pollution receptors make a firm to perceive air as an input that can be freely used, like a common resource, thus neglecting all external costs imposed to other agents of the economy. In other words, if there were well-defined property rights for air, firms would have to buy the right to pollute it and emissions could be internalized through a market mechanism.

The six-scale Air Quality Index (AQI) rates air quality from 'good' (minimal impact) to 'severe' (affects healthy people and seriously impacts those with existing diseases). The air quality in Chennai has deteriorated sharply, with the AQI downgrading air quality in the city from 'satisfactory' to 'very poor'.

INTRODUCTION

There are numerous effects of air pollution on the ecosystem which in turn have various economic implications. In simple terminology, we can say that air pollution effects can be both direct and indirect. For instance, pollution of air primarily causes respiratory and other health hazards in people who are being directly exposed to various harmful gases. The secondary, and long run impact, would be that following the health problems, the productivity of workers might be adversely affected which in turn hamper output levels. This is how air pollution exerts an indirect effect on the overall economy.

Air pollution causes a variety of environmental effects, besides harming human health. Acid rain is precipitation containing harmful amounts of nitric and sulfuric acids. These acids are formed primarily by nitrogen oxides and sulfur oxides released into the atmosphere when fossil fuels are burned. In the economics of pollution, we see that there is a point where both society and the environment have some satisfaction, or in other words, there is an optimum amount of pollution. The optimum amount of pollution can be defined as the point where the marginal benefit equals the marginal cost of pollution. Air pollution is responsible for major harmful effects on human health, animal lives, natural ecosystems and the man-made environment. It is also responsible for climate change due to the enhanced greenhouse effect, acid rain, and the depletion of the ozone layer that constitute important global environmental problems.

In 2015, WHO and OECD estimated that the economic cost of premature death and disability from air pollution in Europe is close to USD 1.6 trillion. New technologies that contribute to emissions' reductions are constantly being developed. Setting emission limit values for air pollutants, as done under the different Protocols of the Convention, have proven to be an effective tool in stimulating investment in clean technologies. Benefits of improved technology to reduce air pollution

have been quantified in many cases.

AIR POLLUTION AND ECONOMICS

Air pollution takes its toll on the economy in several ways: it costs human lives, it reduces people's ability to work, it affects vital products like food, it damages cultural and historical monuments, it reduces the ability of ecosystems to perform functions societies need and it costs money in remediation or restoration. The relationship between environmental degradation and economic growth has been object of constant debate among environmental economists. During the last two decades, the debate between economic growth and the environment introduced into the discussion. External effects or externality is one of the most basic concepts evoked by economists when looking at problems of environmental pollution. The market impacts of outdoor air pollution are projected to lead to global economic costs that gradually increase to 1% of global GDP by 2060. Costs related to additional health expenditures and labour productivity losses dominate in the long run.

From an economics perspective, demand law suggests an inverse relationship between price and the quantity consumed of a marketable product. However, when a product does not have a very well-established market, this product will be most likely underpriced. This is the case of natural systems such as air or water. The lack of property rights for these natural inputs and the absence of environmental regulation or legal protection to pollution receptors make a firm to perceive air as an input that can be freely used, like a common resource, thus neglecting all external costs imposed to other agents of the economy. In other words, if there were well-defined property rights for air, firms would have to buy the right to pollute it and emissions could be internalized through a market mechanism.

The six-scale Air Quality Index (AQI) rates air quality from 'good' (minimal impact) to 'severe' (affects healthy people and seriously impacts those with existing diseases). The air quality in Chennai has deteriorated sharply, with the AQI downgrading air quality in the city from 'satisfactory' to 'very poor'. Economic assessments are used to evaluate the cost and the economic impact of a policy or regulation related to air quality management. They can also be used to estimate the economic value of the benefits of an air pollution policy or program. Taken together, these assessments can help identify air quality management policies needed to address the risks that have been identified, as well as to focus on the most cost effective ones.

OBJECTIVES OF THE STUDY

1.To study the economic impact of Air pollution using economic tools.

2.To analyse the economic effect of Air Pollution in Chennai City.

ECONOMIC TOOLS AND ANALYSIS OF AIR POLLUTION- AT INTERNATIONAL LEVEL

Economic models show that with the introduction of additional measures some sectors will lose jobs (e.g. the fossil fuel sector); but that other sectors will gain jobs (e.g. the building and equipment sectors). In the long run environmental policy will favour the economy as it stimulates more efficient use of resources, and the health benefits would increase GDP by up to 10%. A larger market for clean technologies will reduce the costs of producing the required equipment and thus the abatement measures. Countries that move first expand their possibilities for a growing clean tech industry. Reducing emissions is a wise long term investment that contributes to several development goals and ultimately will yield substantial benefits. The Convention sets emission limit values for air pollutants and these have proven to be an effective tool in stimulating investment in clean technologies, including in the energy sector, and will thus also promote sustainable industrialization.

A techno-economic database of information on control technologies for air pollution abatement and their costs is being developed internationally. The information may be used both in the formulation of draft revisions of technical annexes to existing Protocols to the Convention, as well as for input data to integrated assessment modelling. The information assists countries in identifying technologies, including for industry and in the energy sector that helps reduce air pollution which gives an affordable and clean energy and sustainable development in industry, innovation and infrastructure.

HEALTH BENEFITS AND ECONOMIC VALUE

The results of risk assessments can be used as part of an assessment of the economic benefits from reducing emissions. The Environmental Benefits Mapping and Analysis Program (BenMAP) is a tool for estimating health impacts, and the associated economic values, resulting from changes in ambient air pollution.

Economic Analysis

Guidelines for Preparing Economic Analyses establish a sound scientific framework for performing economic analyses of environmental regulations and policies.

Economic and regulatory impact analyses conducted by EPA for many air pollution rules,

as well as guidance and tools for cost, benefit and economic analyses for air pollution rules can be found at Economic and Cost Analysis for Air Pollution Regulations. The EPA report received extensive review and input from the Advisory Council on Clean Air Compliance Analysis, an independent panel of distinguished economists, scientists and public health experts established by Congress in 1991.

ECONOMICS OF AIR POLLUTION-INDIAN SCENARIO

It has been estimated by a study that air pollution cost India 8.5% of its GDP in 2013. A World Bank study shows that welfare costs and lost labour income due to air pollution amounted to 8.5% of India's GDP in 2013 Measures to safeguard the environment are often considered to be economic spoilers as they entail putting restrictions on economic activity such as shutting a polluting factory or scrapping old vehicles. What is not taken into account while making these calculations is the cost imposed on people living in regions where pollution and environmental degradation is higher.

The cost of air pollution: strengthening the economic case for action, a joint study by World Bank and University of Washington, released on Thursday, might be useful in dispelling such a blinkered view on costs of controlling pollution. According to the report, total welfare losses between 1990 and 2013 because of premature deaths from air pollution increased by 94%. Of this, damages from ambient PM 2.5 air pollution rose by 63% during this period to $3.5 trillion, while damages from household air pollution from cooking with solid fuels jumped almost four-fold to $1.5 trillion, adjusted to the purchasing power parity (PPP) in 2011.

In terms of welfare losses because of air pollution, India ranks second after China at $505.1 billion, or 7.69% of its gross domestic product (GDP), in 2013. Premature deaths due to air pollution in 2013 cost the global economy about $225 billion in lost labour income, or about $5.11 trillion in welfare losses, worldwide, according to the report.

India reported the highest loss in labour output in 2013 owing to air pollution globally at $55.39 billion (2011 PPP-adjusted), or 0.84% of its GDP. China followed close behind with $44.56 billion, or 0.28% of its GDP, lost due to forgone labour output.Adding welfare costs and costs of lost labour due to air pollution puts India's GDP loss at more than 8.5% in 2013. India's GDP growth at constant prices was less than 7% in 2013-14. So air pollution alone might be offsetting the Indian economy's growth efforts. As is to be expected, increasing air pollution also entails large-scale suffering. The report ranks air pollution as the fourth biggest fatal risk factor in the world. Air pollution kills more people than tobacco, alcohol or drug use or unsafe sex in most countries. At 10.1% of total deaths globally, air pollution ranked fourth among the leading fatal health risks after metabolic risks, dietary risks and tobacco smoke. For poorer countries, the impact of bad air quality has been worse. Low- and middle-income countries account for 93% of the deaths and non-fatal illness each year from air pollution. India and China also accounted for the highest number of deaths due to air pollution in 2013. But while China reported an increase of only 7% between 1990 and 2013, deaths due to air pollution in India during the same period increased by 34.5%.

The number of deaths due to air pollution was also higher for children and older people. In 2013, the mortality rate due to air pollution was 18 deaths per 100,000 people under age 5, which increased to 397 deaths per 100,000 in people over age of 70, according to the report. Disability-adjusted life years, too, were higher for young children and among adults aged 60-64 years. Disability-adjusted life year is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. For young children, the majority of deaths resulted from lower respiratory infections, while for the older age groups, heart and pulmonary diseases were the major causes.

SCENARIO IN CHENNAI

Chennai is one of the important coastal mega cities in India. It is located in the eastern coastal side of South India. Many industries have come up in the city over the past two decades which are located near the coast. Due to change in the roughness length and difference in land and sea temperatures, sea breeze is developed and Thermal Internal Boundary Layer is observed. Due to this all the pollutants released from the industries will be dispersed towards the inland and in turn affect the environment and health. Tamil Nadu constitutes the south-eastern extremity of the Indian peninsula. Chennai is the capital city of the State, besides being an important district. The district city is one of the metropolises of India and serves as the gateway of the culture of South India. Chennai is situated on the north-east end of Tamil Nadu on the coast of Bay of Bengal. It lies between 12* 9' and 13* 9' of the northern latitude and 800 12' and 800 19' of the southern longitude on a `sandy shelving breaker swept beach'. It stretches nearly 25.60 kms along the Bay coast from Thiruvanmiyur in the south to

Thiruvottiyur in the north and runs inland in a rugged semi-circular fashion. It is bounded on the east by the Bay of Bengal. Chennai is one of the leading cities in India today from the point of view of trade and commerce, with the fourth largest port in the country and the first to have developed a full-fledged container terminal tointernational standards. Chennai is also one of the most important industrial cities of the sub¬continent.

The data is collected from Central Pollution Control Board (CPCB) New Delhi, for the period from 2000-2004 in industrial and residential areas for the selected coastal Mega City-CHENNAI.

ANALYSIS AND RESULTS OF THE STUDY

The concentration of SO2, NO2 and SPM in Chennai are analyzed from 2000 to 2004. The pollution levels in this mega city of India have been exceeded the WHO air quality guidelines. The data is collected for three industrial and two residential areas at different locations in the city, these are Kathivakkam (I), Manali PS (I), Thiruvottiyur (I), General Hospital (R), Santhome (R).

AIR QUALITY INDEX:

The following discussion summarizes the information that can be drawn from the calculated indices. AQI for four places of Chennai city are given in Tables 2 to5

Air quality Index for T.Nagar

	2007	2008	2009	2010	2011	2012
JANUARY	94	105	105	154	154	123
FEBRUARY	119	129	207	109	119	125
MARCH	101	141	132	170	103	164
APRIL	100	98	98	125	137	111
MAY	91	124	194	154	210	246
JUNE	57	149	111	178	113	190
JULY	91	182	170	133	92	92
AUGUST	88	96	160	160	182	96
SEPTEMBER	90	113	182	167	287	176
OCTOBER	97	121	160	177	279	176
NOVEMBER	135	144	164	83	255	271
DECEMBER	143	162	204	129	253	107

Likewise, the concentration levels of SO2, NO2 and SPM are observed from the data collected from CPCB. The concentrations of SO2 and NO2 are observed to be in low conditions according to NAAQS standards in both industrial and residential areas (6). But compared to residential areas i.e., General Hospital and Santhome the concentrations in the industrial areas i.e., Kathivakkam, Manali PS and Thiruvottiyur are observed to be more. The concentrations of SO2 range from 6.10µgm-3 at residential areas and 40.90µgm-3 in industrial areas. An increase in the concentrations of SO2 and NO2 is observed from 2000 to 2004. Low conditions of NAAQS standards are observed in the concentrations of SPM in both industrial and residential areas

Air Quality Index for Kilpauk

	2007	2008	2009	2010	2011	2012
JANUARY	164	156	156	95	44	92
FEBRUARY	99	139	121	94	115	271
MARCH	117	149	113	190	135	541
APRIL	100	95	95	98	162	301
MAY	91	123	143	76	113	301
JUNE	81	103	86	99	81	212
JULY	129	79	119	78	127	162
AUGUST	52	87	94	87	176	170
SEPTEMBER	147	200	119	97	137	168
OCTOBER	154	135	99	93	125	160
NOVEMBER	200	165	149	63	86	170
DECEMBER	182	128	119	79	170	115

Air Quality Index for Anna Nagar

	2007	2008	2009	2010	2011	2012
JANUARY	94	105	105	154	154	123
FEBRUARY	119	129	207	109	119	125
MARCH	101	141	132	170	103	164
APRIL	100	98	98	125	137	111
MAY	91	147	194	154	210	246
JUNE	57	149	111	178	113	190
JULY	91	182	170	133	92	92
AUGUST	88	96	160	160	182	96
SEPTEMBER	90	113	182	167	287	176
OCTOBER	97	121	160	177	279	176
NOVEMBER	135	159	164	83	255	271
DECEMBER	143	167	204	129	253	107

Air Quality Index for Adyar

	2007	**2008**	**2009**	**2010**	**2011**	**2012**
JANUARY	**54**	**61**	**61**	**30**	**44**	**53**
FEBRUARY	**45**	**61**	**74**	**37**	**29**	**76**
MARCH	**39**	**44**	**43**	**40**	**36**	**91**
APRIL	**31**	**39**	**36**	**31**	**41**	**58**
MAY	**36**	**49**	**51**	**43**	**59**	**77**
JUNE	**31**	**41**	**25**	**36**	**34**	**78**
JULY	**40**	**27**	**19**	**29**	**44**	**65**
AUGUST	**31**	**24**	**39**	**33**	**55**	**57**
SEPTEMBER	**32**	**44**	**33**	**27**	**55**	**71**
OCTOBER	**53**	**67**	**50**	**28**	**86**	**71**
NOVEMBER	**43**	**53**	**60**	**34**	**75**	**83**
DECEMBER	**63**	**61**	**65**	**45**	**92**	72

If the index is 0 to 100 the air quality is good, if the index is 101-200, the air quality is moderate, if the index is 201-300, the air quality is poor, if it is 301-400, the air quality is very poor, if it is 401-500, the air quality is severe.

The air quality in T. Nagar and Anna Nagar lies between moderate and poor status. The air quality in Kilpauk liesbetween very poor and severe status.AQI remains good in Adyar. From the above tables AQI got worsened from the year 2007 to 2012.

Impacts on Human Health

Gender of respondents.

	Frequency	Percent	Valid Percent	Cumulative
Male	81	89.0	89.0	89.0
Female	10	11.0	11	100
Total	91	100	100	

Occupation of respondents.

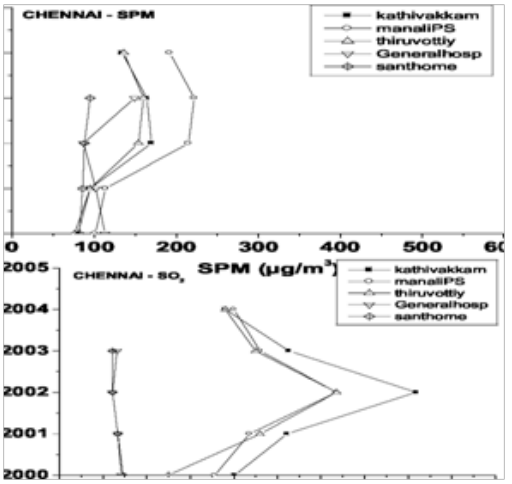
	Frequency	Percent	Valid Percent	Cumulative %
DRIVER	31	34.1	34.1	34.1
VENDOR	47	51.6	51.6	85.7
PASSERBY	13	14.3	14.3	100.0
Total	91	100.0	100.0	

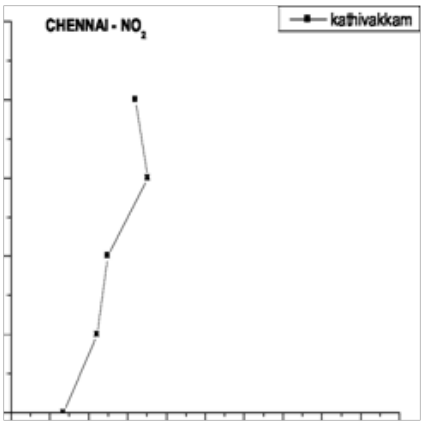
Age of respondents

	Frequency	Percent	Valid Percent	Cumulative %
<=30	24	26.4	26.4	26.4
31-40	30	33.0	33.0	59.3
41-50	21	23.1	23.1	82.4
>50	16	17.6	17.6	100.0
Total	91	100.0	100.0	

Person with disease

	Frequency	Percent	Valid Percent	Cumulative %
Valid no disease	45	49.5	49.5	49.5
Disease	46	50.5	50.5	100
Total	91	100	100	





CONCLUSION

1.The analysis of data collected from CPCB, Delhi during 2000 to 2004 shows that the concentration levels have been increased from 2000 to 2004 due to dense population and rapid industrialization. Industries, automobiles, domestic fuel consumption and the use of domestic appliances contribute to the emissions while gases from garbage dumps contaminate the air. Due to increase in pollutants the temperatures inside the cities are higher around 40 C to 60 C compared to the surrounding rural areas.

2.Increasing economic growth and energy has lead to a significant increase in the emissions of air pollutants.

3.Rising emissions, together with other factors, such as climate change, has led to increasing concentrations of particulate matter (PM2.5) and ground level ozone.

4.Increasing concentrations of PM2.5 and ozone has led to substantial effects on health and the environment. In particular, premature deaths from outdoor air pollution in 2010 amounted to around 3 million people, while they are projected to be 6-9 million in 2060.

5.The annual costs of these premature deaths from outdoor air pollution, calculated using estimates of the individual willingness-to-pay to reduce the risk of premature death, are projected to be USD 18-25 trillion in 2060. In addition, the costs of pain and suffering from illness are estimated at estimated at around USD 2.2 trillion by 2060.

SUGGESTIONS

1.Measures have to be taken by government to improve ambient air quality taking in view of the public health. These measures include usage of clean fuel such as CNG, closure of high polluting industrial units, phasing out off older vehicles, periodic check on vehicle pollution certificates and encouraging people to use public transport means like metro rails and high capacity buses. The survey results prove that most of the people affected by air pollution resulted in chronic diseases.

2.The people also has to take up some severe precautions to bring down the concentration of pollutants and reduce the use of energy consumable goods.

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13. A STUDY ON WATER QUALITY IN KANYAKUMARI DISTRICT, TAMIL NADU, INDIA

Dr. R. STEPHEN CHELLAKAN, Assistant Professor, College of Administrative and Financial Sciences, AMA International University, Bldg 829, Road 1213, Blk 712, Salmabad, P.O. Box 18041, Kingdom of Bahrain.

ABSTRACT

Analyses of physical and chemical examinations were undertaken for the river and pond water resources of Kanyakumari district, Tamil Nadu, India. The study has chosen two main rivers and four ponds in the study area mainly because these water sources are used by village people for drinking and bathing purposes. Water quality parameters viz., Turbidity, Total dissolved solids, Electrical conductivity, pH, Total Hardness, Nitrite, Sulphite, Phosphate, Bacteriological examinations, and Faecal Coliform were analysed as per the Bharat Indian Standard. The laboratory results of pH, Nitrate (NO3), Sulphate (SO4) and Faecal Coliform per 100 ml are within the standard permissible limits for all four tap water samples. In Villukuri, the values of Turbidity, Total Harness, Electrical conductivity, Total Hardness, Nitrate, Nitrite and Sulphate have shown the highest among the four stations viz., 6 NTU, 740 mg/L, 1112 micS/cm, 312 mg/L, 022 , 10, and 39 mg/L respectively. The Faecal coliform and the E. coli counts exceeding acceptable limits are indicative of pollution from domestic wastes from several informal settlements located along the riverbank. Water uses in the area were determined and were found to be mainly domestic and recreational. The gross pollution of the river exposes the local people who depend on it for their primary water source to serious health risk.

KEYWORDS: water quality, river, water, physic-chemical

INTRODUCTION

Water pollution is an undesirable change in the state of water, contaminated with harmful substances. When toxic substances enter lakes, streams, rivers, oceans, and other water bodies, they get dissolved or lie suspended in water or get deposited in the bed. This results in the pollution of water whereby the quality of the water deteriorates, affects aquatic ecosystems. Pollutants can also seep down and affect the groundwater deposits. It is the second most important environmental issue next to air pollution.

Pollution of the water bodies disturbs the ecosystem as a whole. Polluted water is not only unsafe for drinking and other consumption purposes, but it is also unsuitable for agricultural and industrial uses. The effects of water pollution are detrimental to human beings, plants, animals, fish and birds. Polluted water also contains virus, bacteria, intestinal parasites and other pathogenic microorganisms. Using it for drinking purpose is the prime cause for waterborne diseases such as diarrhoea, dysentery and typhoid

SOURCES OF WATER POLLUTION

The important sources of water pollution are domestic wastes, industrial effluents and agricultural wastes. Other sources include oil spills, atmospheric deposition, marine dumping, radioactive waste, global warming and eutrophication. Among these, domestic waste (domestic sewage) and industrial waste generate maximum pollutants, which make their way to groundwater and surface water bodies.

Depending on the origin, the sources are classified as point source and non-point source. Point source pollution discharges the harmful waste directly into water bodies, for example, disposal through wastewater treatment plants. On the other hand, the main form of nonpoint source pollution is the polluted runoff that drains into streams, rivers, lakes and estuaries, Schulz and Howe (2003). Runoff occurs when rainwater or irrigation water does not soak into the ground but rather runs off the land or developed surfaces into a body of water. As runoff flows over surfaces of streets, parking lots, yards, construction sites, farms, and forests, it picks up the things in its path including fertilizers, loose soil (sediment), animal waste, leaking motor oil, chemicals such as pesticides and herbicides, oil, grease, metals, pathogens (bacteria and viruses) and trash. This runoff then drains either directly to a water body and carries with it the pollutants it has picked up, Dwivedi et al (2006).

DISEASE BURDEN DUE TO WATER POLLUTION AT THE GLOBAL LEVEL

Polluted water, the root cause of most of the water borne diseases, is caused by human activities like rapid unplanned urbanization, industrialization, agricultural pollutants like pesticides and insecticides, improper waste management in the urban areas. Poor water quality continues to pose a major threat to human health. Diarrhoeal disease alone

amounts to an estimated 4.1 per cent of the total Disability Adjusted Life Years (DALYs) of global burden of disease and is responsible for the deaths of 1.8 million people every year (Battersby, 2013). It was estimated that 88 per cent of that burden is attributed to unsafe water supply, sanitation and hygiene and is mostly concentrated on children in developing countries.

DISEASE BURDEN DUE TO WATER POLLUTION IN INDIA

The public health impact of water pollution in India is enormous. A number of diseases with high morbidity and mortality are wide spread in the communities specially living in unsuitable environmental conditions in urban slums and vast rural areas. The major diseases that are attributed to water pollution and poor drinking water supply are: diarrhoeal diseases, cholera, shigellosis, escherichia coli diarrhoea, poliomyelitis, typhoid, water borne viral hepatitis. Of these, diarrhoeal diseases alone causes more than 0.6 million deaths annually. In slum areas of major cities, diarrhoeal incidence is as high as 10.5 episodes per child per year (Selendy, 2011).

Diseases caused by faeco-orally transmitted enteric pathogens account for 10 per cent of total burden of disease in India. Statistics indicate that intestinal group of diseases claim about 5 million lives and about 50 million people suffer from these diseases every year. Apart from biological contaminants, chemical contaminants namely fluoride, arsenic and other heavy metals pose a very serious health hazard in the country. It is estimated that about 70 million people in 20 states are at risk due to excess fluoride and around 14 million people are at risk due to excess arsenic in ground water (Pathak, 2007). Apart from this, increase in the concentration of chloride, Total Dissolved Solids (TDS), nitrate, iron in ground water is of great concern for a sustainable drinking water programme. With over extraction of groundwater, the concentration of chemicals is increasing on a regular basis.

HEALTH EFFECTS OF WATER POLLUTION

The effects of water pollution are not only devastating to people but also to animals, fish, and birds. Polluted water is unsuitable for drinking, recreation, agriculture, and industry. It diminishes the aesthetic quality of lakes and rivers. More seriously, contaminated water destroys aquatic life and reduces its reproductive ability. Eventually, it is a hazard to human health. Water-related diseases are infectious, spread primarily through contaminated water. Though these diseases are spread either directly or through flies or filth, water is the chief medium in the spread of these diseases and hence they are termed as water-borne diseases.

Most intestinal (enteric) diseases are infectious and are transmitted through faecal waste. Pathogens, which include virus, bacteria, protozoa, and parasitic worms, are disease producing agents found in the faeces of infected persons. These diseases are more prevalent in areas with poor sanitary conditions. These pathogens travel through water sources and interfuses directly through persons handling food and water. Since these diseases are highly infectious, extreme care and hygiene should be maintained by people looking after an infected patient. Hepatitis, cholera, dysentery, and typhoid are the more common water-borne diseases that affect large populations in the tropical regions.

A large number of chemicals that either exist naturally in the land or added due to human activity dissolve in the water, thereby contaminating it and leading to various diseases. Exposure to polluted water can cause diarrhoea, skin irritation, respiratory problems, and other diseases, depending on the pollutant that is present in the water body. Stagnant water and other untreated water provide a habitat for mosquitoes and a host of other parasites and insects that cause a large number of diseases especially in the tropical regions. Among these, malaria is undoubtedly the most widely distributed disease that causes more damage to human health.

MATERIALS AND METHODS

Study Area

Surface water is vital to the survival of not only humans but also aquatic life, and wildlife. Rivers, lakes, ponds and streams form surface sources. In Kanyakumari district, the surface water is traditionally used for fishing, drinking, swimming, domestic, and irrigation purposes. However, in spite of the fact that the district is industrially backward, water of the ponds, lakes and river are polluted mainly due to discharge of waste water from residential areas, sewage outlets, solid waste, agriculture run-off, dumping of garbage, hospital wastes, automobile and oil waste. In recent years, surface water sources lose their importance due to the introduction of bore-well technology and centralized water supply system. In rural areas, all the people do not get safe drinking water sources and so people make use of surface water sources also. Some households make use of both surface sources and piped water. Hence the investigator has collected water samples from rivers, ponds, and tap

water from different locations and given for testing in laboratory. Various physical and chemical parameters collected from different sources of water samples are presented below. Rivers in many parts of rural India are the main water source for agricultural, industrial and domestic purposes. The two major rivers in the district are Pazhayar (R1) and Tamirabarani (R2). The Pazhayar originates from the forested area of Surulacode, carries small streams from Mahendragiri peak and flows through Thovalai and Agastheeswaram taluks. The total length of the river is about 37 km and it passes through Boothapandi, Thazakudi, Putheri, Nagercoil, Suchindrum and finally joins the Arabian Sea. The sample collected from Pazhayar river is near Suchindrum bridge. The river Tamirabarani is locally known as Kuzhithuraiar. The origin of Tamirabarani is in the Western Ghats and the river confluences with Laccadive Sea near Thengapattanam, about 56 kilometres west of Kanyakumari town. The sample collected from Tamirabarani river is near Marthandam bridge, which is at the end of the river. The quality of the river water is affected by various agents, which enters into the river on its way. The tested values are given in the following table .
Kanyakumari district is also called as "The District of Ponds". A pond is a body of standing water, either natural or man-made, that is usually smaller than a lake. Ponds have been used since time immemorial as the traditional source of water source in this district. The investigator has collected water samples from four different ponds covering the entire district viz., Rettaikulam (P1), Kariyankulam (P2), KakaiponKulam (P3) and Chenkulam (P4) to test the quality of water in ponds. The table 2 shows the test results of quality of four ponds in the study area.

RESULTS AND DISCUSSIONS

3.1. Quality of River Water

The tested values of Total Dissolved Solids (TDS), pH, Total Hardness (CaCO3), Nitrate (NO3) and Sulphate (SO4) show that these values are recorded within the permissible limits, but the turbidity value of water samples varied from 17 to 18 Nephelometric Turbidity Units (NTUs) in Pazhayar and Kuzhithuraiar rivers respectively, these values exceed three times above the BIS standard of 5 NTU. Water should be free from turbidity because turbidity impedes efficient chlorination. Electrical conductivity (EC) values are higher than permissible limit of zero micS/cm, the values are 490 micS/cm and 122 micS/cm in Pazhayar and Kuzhithuraiar rivers respectively, indicating the presence of high amount of dissolved inorganic substances in ionized form.

TABLE 1

QUALITY OF RIVER WATER IN THE SURVEYED AREA

Sl. No	Parameters	BIS	Range	R1	R2	Comparison with BIS Standard
1	Turbidity NTU	5	17-18	17	18	Exceed
2	Total dissolved Solids mg/L	500	81-323	323	81	within
3	Electrical conductivity micS/cm	0	122-490	490	122	Exceed
4	pH	6.5 to 8.5	7.15-7.84	7.84	7.15	within
5	Total Hardness as CaCO3	300	40-128	128	40	within
6	Nitrite as NO2	0	0.18-1.84	1.84	0.18	Within
(Except R1)						
7	Nitrate as NO3	45	2-3	3	2	within
8	Sulphate as SO4	200	3-17	17	3	within
9	Phosphate as PO4	0	0.8-1.85	1.85	0.8	Exceed
10	Bacteriological Organisms	0	25506-25664	25506	25664	Exceed
11	Fecal Coliform per 100mml.	0	630-780	630	780	Exceed

Source: Test Reports

A trace of Nitrate content is found in river water samples. It varies from 0.8-1.85 miligrams per litre (mg/l). Nitrate should be zero in potable waters, its presence indicates pollution of recent origin. Phosphate in surface water mainly originates from sewage effluents, which contain phosphate-based synthetic detergents. The values of phosphates are highest in Pazhayar with 1.85 mg/l and lowest in Kuzhithuraiar with 0.8 mg/l. The low value indicates that decreased land drainage, sewage and fertilizer disposal from the surface run-off. The table 1 also shows a high presence of bacteriological and Faecal Coliform contents

in both the rivers, which means the water gets polluted while passing through its way.

QUALITY OF POND WATER

From the table 2 it is clear that, in all the four ponds, the tested results of Total Dissolved Solids, Total Hardness, Nitrite, Nitrate, and Sulphate are within the permissible limits.All other parameters are above the BIS standard. While, Chenkulam recorded the lowest values among other ponds for the parameters viz., Turbidity 4 NTUs, Total Hardness 98 mg/l and Nitrate 2 ppm, it has the highest bacteriological organisms of 25,738 and 2300 coliforms per 100 mml water.

TABLE 2

QUALITY OF PONDS IN THE SURVEYED AREA

No.	Parameters	BIS Standard	Range	P1	P2	P3	P4	Comparison with BIS Standard
1	Turbidity NTU	5	4-16	9	16	5	4	Exceed
2	Total dissolved Solids mg/L	500	98-398	160	398	341	98	within
3	Electrical conductivity micS/cm	0	148-603	243	603	517	148	Exceed
4	pH	6.5 to 8.5	7.29-9.24	9.24	7.68	7.49	7.29	Within
(Except P1)								
5	Total Hardness as CaCO3	300	40-152	48	140	152	40	within
6	Nitrite as NO2	0	0.16-0.24	0.18	0.24	0.16	0.18	Within
(Except P2)								
7	Nitrate as NO3	45	2-7	3	7	3	2	within
8	Sulphate as SO4	200	4-24	6	24	10	4	within
9	Phosphate as PO4	0	0.65-1.15	0.65	0.75	1.15	0.85	Exceed
10	Bacteriological Organisms	0	2 5 5 0 8 - 25738	25508	25666	25728	25738	Exceed
11	Fecal Coliform per 100mml.	0	60-2300	460	60	180	2300	Exceed

Source: Test Reports

It means Chenkulam is highly contaminated while compared with other ponds with domestic and agricultural wastes. Kariyankulam has the highest turbidity of 16 NTUs, electrical conductivity of 603 micS/cm, Nitrite of 0.24 mg/l due to decaying of plants and animals and Nitrate (NO3) of 7 mg/l. The pH value is highest in Rettikulam with 9.24 units, due to biological activity and inflow of cottage industries/ effluents and Total Hardness is highest in Kakaiponkulam with 152 units. From the results, all the four ponds are not fit for any domestic purpose other than bathing animals.

CONCLUSION

From the discussions carried out above, it is observed that, all the surface water sources tested are highly polluted. The finding is found to be within the framework of negative water externality theory. The laboratory results of pH, Nitrate (NO3), Sulphate (SO4) and Faecal Coliform per 100 ml are within the standard permissible limits for all four tap water samples. In Villukuri, the values of Turbidity, Total Harness, Electrical conductivity, Total Hardness, Nitrate, Nitrite and Sulphate have shown the highest among the four stations viz., 6 NTU, 740 mg/L, 1112 micS/cm, 312 mg/L, 022 , 10, and 39 mg/L respectively. People living nearby these surface water resources largely depend as a sources for drinking and domestic purpose. Numerous studies indicate a possible link between water pollution and human disease. The river water from these localities should be avoided totally for drinking and cooking purpose. Adopting proper collection, transporting, treatment, and disposal of waste water system for the adjoining habitations along the surface river and pond will give the solution in order to protect not only the surface water, but also to save the Kanyakumari District from the pollution.

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14. ENVIRONMENTAL HAZARDS ANDIT'S IMPACT ON HUMAN HEALTH

G. GEETHA, Ph.D Research Scholar, Department of Economics, Thiruvalluvar University, Serkkadu, Vellore - 632115.

Dr.S. DHANASEKARAN, Assistant Professor, Department of Economics, Thiruvalluvar University, Serkkadu, Vellore - 632115.

ABSTRACT

This paper provides the insight view about the environmental hazards and its impact on human health. Environmental hazards means every type of disorder that occur in the environment .Hazards can present themselves to us in various media e.g. air, water. The influence they can exert on our health is very complex and may be modulated by our genetic makeup, psychological factors and by our perceptions of the risks that they present. Every year thousands of deaths are reported because of environmental hazards. Environmental hazards can affect a particular organ or body system, directly damaging it or leading to further complications. In this paper we discuss about various hazards such as physical hazards (electromagnetic radiation and ionizing radiation),chemical hazards (combustion of coal, petroleum), biological hazards (contamination of water) and psychosocial hazards (stress).And also various types of pollution caused by the environmental hazards which results in various health problems such as liver damage, chronic headaches, mental retardation or damage to reproductive organs. These hazards place extra stress on our bodies.

INTRODUCTION

Environmental hazards may be defined as those extreme events either natural or anthropogenic which exceed the tolerable magnitude within or beyond certain time limits, make adjustment difficult, resulting catastrophic losses of property, income and lives and become head lines of different news media at world level. The term environmental hazard may be distinguished from environmental disaster as follows. Hazards are the processes which cause an accident or extreme event or danger whereas disaster is a sudden adverse or unfortunate extreme event which causes great damage to human beings as well as plants and animals, i.e., disasters occur rapidly, instantaneously and indiscriminately. Thus, environmental hazards are the processes whereas environmental disasters are the results or responses of environmental hazards.

Hazardous chemicals escape to the environment by a number of natural and/or anthropogenic activities and may cause adverse effects on human health and the environment. Increased combustion of fossil fuels in the last century is responsible for the progressive change in the atmospheric composition. Air pollutants, such as carbon monoxide (CO), sulfur dioxide (SO2), nitrogen oxides (NOx), volatile organic compounds (VOCs), ozone (O3), heavy metals, and reparable particulate matter (PM2.5), differ in their chemical composition, reaction proper ties, emission, time of disintegration and ability to diffuse in long or short distances. Air pollution has both acute and chronic effects on human health, affecting a number of different systems and organs. It ranges from minor upper respiratory irritation to chronic respiratory and heart disease, lung cancer, acute respiratory infections in children and chronic bronchitis in adults, aggravating pre-existing heart and lung disease, or asthmatic attacks. In addition, short- and long-term exposures have also been linked with premature mortality and reduced life expectancy. These effects of air pollutants on human health and their mechanism of action are briefly discussed here.

Although a number of physical activities (volcanoes, fire, etc.) may release different pollutants in the environment, anthropogenic activities are the major cause of environmental air pollution. Hazardous chemicals can escape to the environment by accident, but a number of air pollutants are released from industrial facilities and other activities and may cause adverse effects on human health and the environment. By definition, an air pollutant is any substance which may harm humans, animals, vegetation or material. As far as humans are concerned an air pollutant may cause or contribute to an increase in mortality or serious illness or may pose a present or potential hazard to human health. The determination of whether or not a substance poses a health risk to humans is based on clinical, epidemiological, and/or animal studies which demonstrate that exposure to a substance is associated with health effects. In the context of human health, ''risk'' is the probability that a noxious health effects may occur.

NATURAL HAZARDS

A natural hazard is a naturally occurring event that might have a negative effect on people or the environment. It includes geophysical hazards which encompass geological and meteorological phenomena such as earthquakes, coastal erosion, volcanic eruption, cyclonic storms, and drought.

Natural hazards are further subdivided into two categories:

Planetary Hazards

Endogenous Hazard

Hazards which originate inside the surface of the earth are termed as endogenous hazard or terrestrial hazard. Eg. Volcanoes,Earthquake.

Exogenous Hazard

Hazards which originate above the surface of the earth (in the atmosphere) are called exogenous hazard. Eg. Cyclone, Drought, Rainfall etc.

Extra Planetry Hazards

Hazards which originate outside the region of the planetary orbits.

Anthropogenic Hazards

Manmade disasters are hazards caused by human action or inaction. They are contrasted with natural hazards. Manmade disasters may adversely affect humans, other organisms and biomes and ecosystems. The frequency and severity of hazards are key elements in some risk analysis methodologies.

PHYSICAL HAZARDS

Physical hazards affect populations all over the world, regardless of wealth, location or other factors which tend to differentiate people and cultures from one another. Physical hazards in the environment are naturally occurring events and disasters with the capability of threatening physical safety. Hurricanes, volcanic eruptions, tornados, earthquakes, floods, and landslides are all different types of physical hazards that can have devastating effects on mankind (Library Index, Natural Hazard, 2011).

There are primary and secondary effects to these physical hazards. Primary effects are a result of the event or disaster itself. For instance, flood waters damaging houses and buildings, or the collapse of structures due to an earthquake, hurricane, landslide or sinkhole. Secondary effects occur because a primary effect has caused them to happen. An example of a secondary effect is a power outage, or a fire started because of an earthquake. Although we cannot predict a precise location or the magnitude of a physical hazard, some of the consequences can be greatly reduced by strategies such as building design, better land management and regulations, and education on how we can better use our land.

IMPACTS OF PHYSICAL HAZARDS ON HEALTH

Important issues concerning physical hazards include those relating to health effects of electromagnetic radiation and ionising radiation. If one excludes the occupational environment, then noise and other physical hazards may present a nuisance to many inhabitants, and impair general wellbeing. Environmental noise does not usually contribute to deafness but notable exceptions may include noisy discotheques and “personal stereos”.

Electromagnetic radiation ranges from low frequency, relatively low energy, radiation such as radio and microwaves through to infrared, visible light, ultraviolet, X-rays and gamma rays. These last as well as other forms of radioactivity such as high energy subatomic particles (e.g. electrons - Beta rays) can cause intracellular ionisation and are therefore called ionising radiation. Exposure to ultraviolet (UV) radiation carries an increased risk of skin cancer such as melanoma, and of cataracts which are to an extent exposure related. Some pollutants such as chlorofluorocarbons (CFCs) used as refrigerants or in aerosol propellants or in the manufacture of certain plastics can damage the “ozone layer” in the higher atmosphere (stratosphere) and thus allow more UV light to reach us, and harm us directly. Radioactivity is associated with an exposure dependent risk of some cancers notably leukemia. Contrary to popular belief however, most radiation to which the average person is exposed is natural in origin, and, of the manmade sources, medical diagnosis and treatment is on average the largest source to the individual. A very important issue is the extent to which radon gas arising from certain rock types beneath dwellings can contribute to cancer risk..

CHEMICAL HAZARDS

Chemicals can be broken down into .hazard classes and exhibit both physical and health hazards. It is important to keep in mind, that chemicals can exhibit more than one hazard or combinations of several hazards. Several factors can influence how a chemical will behave and the hazards the chemical presents, including the severity of the response:

- Concentration of the chemical.
- Physical state of the chemical (solid, liquid, gas).
- Physical processes involved in using the chemical (cutting, grinding, heating, cooling, etc.).
- Chemical processes involved in using the chemical (mixing with other chemicals, purification, distillation, etc.).

Other processes (improper storage, addition of moisture, storage in sunlight, refrigeration, etc.).

IMPACT OF CHEMICAL HAZARDS ON HEALTH

General airborne pollution arises from a variety of causes but can usefully be subdivided into pollution from combustion or from other sources. The image shows the silhouette of a power station - an important source of airborne products of combustion. Combustion of coal and other solid fuels can produce smoke (containing polycyclic aromatic hydrocarbons - PAH) and sulphur dioxide besides other agents such as those also produced by:

Combustion of liquid petroleum products which can generate carbon monoxide, oxides of nitrogen and other agents. Industry and incineration can generate a wide range of products of combustion such as oxides of sulphur and nitrogen, polycyclic aromatic hydrocarbons, dioxins etc. Combustion of any fossil fuel generates varying amounts of particulate matter. It also adds to the environmental burden of carbon dioxide - an important "greenhouse" gas but in these low concentrations it does not affect human health directly.

Health effects of concern are asthma, bronchitis and similar lung diseases, and there is good evidence relating an increased risk of symptoms of these diseases with increasing concentration of sulphur dioxide, ozone and other pollutants. Although high occupational exposures to exhaust especially from diesel, and to benzene does increase the risk of some cancers, reliable direct evidence of an increased to cancer risk to the population at large from the lower levels to which they are exposed is lacking. Incineration can also generate hazardous substances if substances not best suited for disposal by incineration are "disposed" of in this way or if incineration is carried out at too low a temperature (for example this may generate dioxins).

→ Large scale industrial releases with serious acute effects are fortunately rare but you might recollect some events such as in Bhopal (India). Various smaller scale events occur such as leaks from road tankers, or fires in warehouses and factories. Special local environmental exposures can arise for example in communities exposed to drifting pesticide sprays containing say, organophosphates. Some natural phenomena such as volcanic eruptions can present serious risks to health. Fortunately they are rare but can be catastrophic.

Water can be an important source of chemical hazards. It can leach lead from pipes especially if the water is soft. There is good epidemiological evidence that this can have a relatively small but measurable harmful effect especially on neurological function even at levels hitherto considered "acceptable". Other adverse effects can arise from chemicals added to the water.

BIOLOGICAL HAZARDS

Biological hazards are micro-organisms such as viruses, bacteria, fungi, microscopic, parasitic worms, or other pathogens. These harmful micro-organisms are described as a substance that is naturally occurring which can be harmful to humans, causing disease and illness. These hazardous biological agents can enter the body in different routes.

TYPES OF BIOLOGICAL HAZARDS

→ Biological hazards can be put into different categories. The most common biological hazards include: Bacteria – microscopic organisms that live in soil, water, organic matter or the bodies of plants and animals and are characterized by lack of a distinct nucleus and the inability to photosynthesize.

→ Viruses – a group of pathogens that consist mainly of nucleic acids and that lack cellular structure. viruses are totally dependent on their hosts for replication.

→ Fungi – any of a major group of lower plants that lack chlorophyll and live on dead or other living organisms.

Examples of different types of biological hazards:

→ Bacteria – Escherichia coli (E.coli),Mycobacterium tuberculosis (TB),tetanus

- Virses – common cold influenza, measles, SARS, Hantavirus, rabies.
- Fungi – athlete's foot, mould, Rusts, mildew, smut, yeasts, mushrooms.
- Insects stings/bites
- Allergic reactions e.g., peanuts, pollen grains, bee stings
- Poisonous plants/animals e.g., poisonous ivy, cobras.

IMPACTS OF BIOLOGICAL HAZARDS ON HEALTH

Many infectious diseases can spread from contact between people.

For example:

- Athlete's foot – can be spread by sharing footwear and walking barefoot in public showers or change rooms.
- Eye infections – can spread through sharing of makeup applicators, brushes and wipes or by hand to eye contact; e.g., rubbing eyes.

- Colds or flu–can spread through close personal contact; e.g., hand to hand, then the hand is placed near mouth, nose or eye.
- Mononucleosis–can spread through mucus and saliva by kissing or sharing drinks/ water bottles and cigarettes.
- HIV – can spread by exposure to blood and body fluids.
- Hepatitis–two strains hepatitis (B and C) can be spread by exposure to blood or body fluids.

HIV and hepatitis B and C are very serious diseases that can lead to death.

CONCLUSION

It appears that polluted environment is global an issue and world community would bear worst results more as they already faced. As effective response to pollution is largely based on human appraisal of the problem and pollution control program evolves as a nationwide fixed cost-sharing effort relying upon voluntary participation. Education, research, and advocacy, are lacking in the region as preventive strategy for pollution especially in Asia. At present the adoption of environmental auditing in any economic sector is voluntary but future legislation could well make it mandatory and still time available to use technology and information for environmental health decision. Healthy people mean human resources are the main object of any successful business or country. This brief presents the adverse effects of a number of pollutants in human health. The main conclusion is that, in view of increased exposure of human in a diversity of pollutants, dietary interventions, rich in plant –derived foods, may protect or decrease their effects on different organs.

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15. DISPOSAL OF HOUSEHOLD WASTE: PRACTICES, CHALLENGES & MANAGEMENT

Dr. K.SIVA SANKARI, Assistant Professor, Department of Economics, J.B.A.S. College for Women (Autonomous) Chennai – 18.

ABSTRACT

Household waste comprises of garbage and rubbish from individual home and flats/ apartments. This waste consists of fruits and vegetables, food scrapes, papers, cans and bottles, clothes, chocolate wrappers, shampoo bottles and sachets etc. These are non-hazardous wastes generated by household and can be recycled. Hazardous wastes are those from pest control, home cleaners, batteries, garage oils which have adverse impact on the environment and threatens human life and other living organisms. The improper disposal of household hazardous waste by pouring waste oils and cleaners on the ground or disposing the containers along with other wastages affects the people living in that area and also affects the health of sewage cleaners. Dumping of solid wastes in the outskirts or open area has created huge landfills which pose serious threats on environment causing air pollution, contamination of ground water. Another serious problem in improper disposal of domestic waste is in regard to the process of collecting household waste. Lack of equipment and infrastructure for collection, inadequate number of bins and bin capacity, lack of manpower and technical skills and high rate of generation of waste from household sector. The present paper is intended to investigate the practices in the disposal of household waste, problems and challenges of improper disposal and measures for effective household waste management. The paper also highlights suggestions for proper disposal of household waste.

KEYWORDS: Household waste, practices of disposal, household waste management

INTRODUCTION

Generation of waste in unavoidable in all activities of life and in all sectors of production. Anything which cannot be used further and anything which has lost its value and purpose is termed to be waste. All human activities, be it household, commercial, industries generate waste i.e. certain things, commodities or materials which are not required by its owner or producer becomes waste. This study concentrates on solid waste generated by household sector. Household waste comprises of garbage and rubbish from individual household, flats/apartments. Household waste can be classifies as hazardous waste which includes pest control, home cleaners, garbage oil, batteries and non-hazardous waste are those from fruits and vegetables, flowers, food scrapes, animal slaughter, furniture, clothes, hair and plastic covers. The hazardous waste should be disposed carefully and safely so that it will not affect the living beings and also the environment.

The increase in generation of waste can be attributed to population explosion, urbanization, development of technology, changing life style and fashion and increase in income of the people. In particular, the transition from low income to middle/high income results in vast increase of solid waste. This is so because when income increases consumption level also increases and much income is diverted to the purchase of consumer durables. Similarly, people in urban spend large amount of their income on goods and this has resulted in mounting solid waste and landfills.

The improper disposal of household waste has adverse impact on human being, living organisms and environment. It affects the natural resources mainly air, soil and water. Dumping of solid waste in open area leads to landfills which results in air pollution, depletion of soil fertility and pollutes under ground water. This also generates many organisms and micro-organisms such as flies, mosquitoes, bacteria which cause various diseases and pose serious threat on human health.

REVIEW OF LITERATURE

Abraham Lingan and Poyyamoli (2014) investigated the status of municipal waste management in Cuddalore municipality. The study concluded that Cuddalore produced the high level of waste but the waste management technology adopted by the municipality was ineffective because the waste were discarded in street and improper disposal method was practiced. The collection and transportation was not updated and old equipment were used for this process. The study suggested that co-ordination between private sector, rag pickers, and people, individuals, NGOs and municipality would lead to effective and proper disposal of waste.

Indira et al (2015) focused their study on the attitude of the people about household solid

waste disposal in Kumbakkonam district and also to explain about the people's awareness on disposal of waste. The study concluded that people were using small bins of different colours and segregated the waste before disposal, wastes were disposed every day and people were satisfied with the work done by the sweepers.

Joshi and Ahmed (2016) had evaluated the parameters to study the municipal solid waste management system, generation of waste, collection and treatment methods adopted in India. The study concluded that decentralized solid waste units and formal recycling industry would lead to more effective and scientific method of waste management.

Niyati Mahajan (2016) explored the waste management process of informal sector particularly Exnora. Informal sector increases income of waste workers and also convert waste into valuable commodities. The study identified the strengths and challenges faced by Exnora and also the impact of civic awareness created by Exnora to the people. The study concluded that the Civic Exnora innovation had created awareness among the people ad also the co-ordination of local governments, community and technical improvements had positive impact on disposal of solid waste by household sector.

Parvathamma (2014) examined the impact of geopolitical factors on waste management at global and local levels and also the effect of socio-economic factors on waste management. Significance was also given for studying the quantity of solid waste generated and its impact on environment and health of the people. The study concluded that the collection and transportation of waste were effective but few modifications were required for scientific collection and disposal of waste. Decentralized system of waste collection and holistic approaches in the generation of waste, recycle and reuse would reduce waste and produce energy.

Ravesh Agarwal et al (2015) studied the practices of waste management in India, its impact on human being and also suggested measures for its improvement. The study concluded that proper strategic planning and implementation of such plan would protect human health and environment. The suggestions were creating awareness among people, inclusion of waste management methods in education for sensitizing people.

Sivaraman (2015) in his article concluded that incineration was the best method of solid waste disposal. The study conducted in Puducherry and outlined that the non-availability of land was a major constraint in adopting landfilling and composting process. Incineration was the prime method of solid waste disposal and this does not affect human health and environment.

Sunil Kumar et al (2017) made a descriptive analysis on waste management system in India. The authors opined that India has moved from waste dump to waste management. The analysis identified that population growth and development of cities were the major causes for increase in generation of waste in India and the quantity of waste depends on standard of living, eating habits of the people, type of commercial activity, etc. The study also explored the status of waste management in India, various legislations in waste management, recycling and reuse, role of informal sector, impacts of improper disposal of waste on human and environment, landfills and barriers to improved waste management. The analysis concluded that proper and safe disposal of waste, sustainable waste management system, waste-to-energy facilities, engineered landfills, trained persons in collection and management of waste would lead to protection of environment and effective disposal of waste.

METHODOLOGY

Scope of the Study

The present paper intends to make a descriptive analysis on the practices adopted in disposing household waste, impacts of such disposal, challenges faced while disposing waste, proper, scientific and effective methods of disposing and managing household waste.

Objectives of the Study

→ To study the present scenario in disposing the household waste and the impacts of such disposal.

→ To identify the challenges encountered while such disposal method.

→ To explore the effective methods of disposing household waste.

Source Of Information

The study uses secondary information collected from various books, journals, newspapers and websites.

Disposal of household waste - Present Scenario

Presently, household waste are disposed unhazardly in an unscientific manner and these wastes are not treated or cleared which creates odour, release of airborne diseases, etc. The common way of disposing waste adopted by household sector it to collect all the waste, both biodegradable and non-biodegradable together in a plastic bag or small bin and throw it in the large bins or containers provided by the corporation. Many times these wastes are thrown on the roadside, streets or open area

nearby, causing severe health and environment issues. In some cases, waste from vegetables, fruits, egg shell are thrown in the garden or pots as fertilizer for plants. This method of disposal is improper and unscientific and destroys the growth of the plants.

IMPACT OF IMPROPER DISPOSAL OF HOUSEHOLD WASTE

- Affects health of the people and all living organisms.
- Reduces quality of life.
- Degrades environment and causes global warming.
- Deteriorates natural resources.
- Creates odour which leads to air pollution.
- Dumping on land affects ground water,
- Improper disposal causes premature death.
- Landfills blocks drainage and sewerage system causing water logging and floods.
- Insects, mosquitoes and flies are generated.
- Contaminates water resources which cannot be used for drinking and other purposes.
- Unscientific method of burning wastes creates smoke and emits pollutants that lead to breathing and lungs problems.

Challenges in unscientific method of disposing household waste

- Disposal of all types of waste together by household sector.
- No usage of proper dustbins at home.
- Lack of segregation between biodegradable and non-biodegradable waste.
- Inadequate number of dustbins on roads and also less capacity of dustbins.
- Lack of technology in the collection of garbage.
- Lack of infrastructure and equipment for collecting the garbage.
- Less number of sanitary workers and cleaners.
- Limited availability of trained and skilled manpower for strategic planning and framing policy for collection and management of waste.
- Shortage of funds to cover the cost required for collection, segregation. Transportation and treatment of waste.
- Lack of accountability and responsibility of the officials and workers.
- Non availability or limited availability of land for disposal of waste.
- Collection of all types of waste such as solid, liquid, e-waste, animal slaughter, construction waste, metal, medical waste together in the same bin/vehicle.
- Spillage of waste due to uncover and improper transportation.
- The collected wastes are dumped indiscriminately in unhygienic way.
- No proper monitoring and supervision during collection of waste.

EFFECTIVE METHODS OF DISPOSING HOUSEHOLD WASTE

Waste management encompasses all activities needed for managing waste, right from collection transportation, treatment, disposal and also proper supervision and regulation. This also includes the legal acts and provisions required for proper disposal of waste. Organized and well planned disposal of household waste requires the co-ordination and co-operation of public, private, individual households and NGOs. The public sector should initiate policies, regulations and measures for scientific disposal of waste which will protect human health, living organisms and environment. Advanced technology, provision of required equipment, vehicles, manpower, training the sanitary workers, monitoring and supervision would led to management of waste and also protect the environment. Following are some of the methods identified as effective for disposal of waste.

→ ***Segregation:*** Waste should be segregated as biodegradable and non-biodegradable at household level. Similarly, hazardous waste should also be disposed separately in different bins or bags. This will enable recycling and scientific disposal.

→ ***Collection :*** Waste from different sectors such as household, industry, agriculture, construction, medical, commercial, complex should be collected separately. This is because some sectors contain hazardous and non-biodegradable waste.

→ ***Reduce, Reuse, Recycle***:Reduce the usage of plastic and general wastage of food items, fruits and vegetables. Use the amount required for the family. Recycling and reusing of waste generated is the best method of disposal of waste. Waste water recycling and reusing for flush and gardening are gaining popularity.

→ ***Transportation:*** The collected waste should be transported safely to the place of landfill and incineration. Open transport leads to spilling of waste carried in vehicles all over the streets. Covered and closed tempos, mobile compactors should be used for transportation of waste.

→ ***Landfilling:*** This method is dumping of waste in a low lying open area outskirts of residential area. But landfilling leads to production of methane and carbon dioxide

gases which has serious effects on human and environment. This also leads to greenhouse effect and affects the ozone layer. But the effect of landfilling can be reduced through waste minimization, reuse, recycle, etc.

Incineration: This is method adopted for disposing solid waste. Here the solid wastes are set on fire or combustions and are converted into heat, steam or ash form.

→ ***Plastic recycling:*** Plastic wastes are segregated from other type of waste and formed as thread and cut into small pieces. Separate plastic moulding machines are used for moulding to make different products.

→ ***Kitchen garden/Terrace garden:*** The vacant land within the home premises can be utilized for growing spinach and all vegetables by converting kitchen waste into organic manure.

→ ***Shed*** :Construction of common Shed in each area separately for dumping the waste and also a common compost pit for composting wastes.

→ ***Cloth bag:***Using cloth bag will minimize the waste gradually. Cloth bags can be used for shopping and this is reusable.

→ ***Composting:*** this is a method of converting biodegradable waste into organic manure and fertilizers that can be used in agriculture. This organic manure is high in nutrition content required for plants and vegetables. Much of composting are labour intensive.

→ ***Vermicomposting:*** In this method the biodegradable organic wastes are decomposed by introducing earthworms on them and these can be used for plantation.

→ ***Anaerobic digestion:*** Also known as biomethanation process and is a sustainable process of biodegradable wastes. Through stabilization, organic waste is converted as biogas which can be used as energy.

SUGGESTIONS FOR EFFECTIVE DISPOSAL OF HOUSEHOLD WASTE.

- Provision of different colour bins in each street or area for segregating the waste as biodegradable and non-biodegradable.
- Creating awareness among people about the significance of segregation of waste for disposal.
- Awareness through pamplets, street plays, hoardings, cartoons in television, small play in theatres before starting the movie can be displayed.
- Educational institutions can encourage the habit of separating the wastes like food items, papers, plastic, waste from stationery in different bins.
- Orientation on solid waste disposal can be given to children at school and briefing about the impact of improper disposal of waste.
- The sanitation workers and cleaners can demonstrate how to segregate waste effectively and also the difficulties of collecting the waste thrown just like that.
- Fine/penalty can be collected from household which violate the disposal laws and regulations.
- The authorities can send messages on cleanliness, proper and scientific method of disposal, impact of proper disposal on health and environment in social media.
- Corporation/Municiplity can organize competitions like essay writing, poster painting, collage, rangoli, poetry writing, debate, quiz at school and college level to create awareness among the students.
- Prize/awards can be given to the area which abides to the rules of disposal of waste.
- Government should enlighten knowledge on recycling and reusing. This paves way for minimization of waste.
- Provision of proper equipment and vehicles required for collection and transportation of waste and also employing adequate manpower.
- Installation of decentralized composting units to reduce landfilling and dumping of waste in open area.
- Course in waste management should be mandatory at school/college level irrespective of discipline/stream.
- Manufacture and use of plastic bags and other non-biodegradable items should be banned by the government. The law should be very stringent and strict action should be taken against those violating the law.
- Awareness should be created on the significance of service rendered by sanitary workers, cleaners and sweepers. People should change their attitude towards these people and respect them.
- Appropriate water treatment technology should be adopted to preserve the contaminated water by dumping the waste.

CONCLUSION

Population growth, urbanization, transition to high income and change in the life style of the people have resulted in the increased the generation of household waste in our country. The improper and unscientific method of disposal of waste had adverse impact on human life and environment. The need of the hour is to develop the existing method of waste disposal and also monitor that the household strictly adheres to law of disposal. This can be achieved through the co-ordination and co-operation of general public, government, private sector,

NGOs. One effective measure of sensitizing people is creating awareness on segregation, composting, vermicomposting, kitchen gardening, recycle and reuse through street plays, propoganda, pamplets, demonstration, hoardings and banners. Hence, waste disposal and management will be more effective through the combined efforts of the entire nation and this will pave way for sustainable development of our country.

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16.A PROSPECT EVOLVEMENT OF HOUSEHOLD EXPENDITURE ON WATER SUPPLY FOR HEALTH BENIFITS IN CHENNAI

Mrs. R. VIJAYA BAVANI., M.A., M. Phil, Research Scholar,Department Of Economics, Madras Christian College, Tambaram, Chennai.

ABSTRACT

Due to rapid urbanization, especially in developing countries such as India, has affected the availability and quality of groundwater is contaminated, its quality cannot be restored by stopping the pollutants from the source. The common pollutants of groundwater are discharge of agricultural, domestic, and industrial waste, pesticides, etc., which leads to water-borne diseases. Water-diseases may be of microbial origin such as diarrhoea, dysentery, cholera and typhoid and chemical origin such as fluorosis and methemoglobinemia, therefore, in order to consume the quality water people need to spend more on water supply as other household expenditure, such as: food, clothing, housing (rent), energy, transport, etc., A significant number of people purchase water from private and public water suppliers and that they incur a sizeable expenditure on water purchases; some of these households are also willing to pay additional amounts for improved water supply from public and private sources for their health benefits. The results suggest that improvements in water supply would significantly increase the welfare of the people. This is clearly a public health risk that must be addressed along with the issue of water service affordability.

KEYWORDS: Household expenditure on Water supply, water problems and health

INTRODUCTION

Water is essential for life. We need water for every activity in life. Millions of people worldwide suffer from serious diseases because they do not have access to clean drinking water. It is impossible to imagine our lives without an adequate water supply. According to National Water Policy “adequate drinking water facility should be provided to the entire population both in rural and in urban areas and drinking water needs of the human beings should be the first change on any available water’. Adequate water supply is not merely dependent on the existence of a water source. Therefore, when assessing people’s level of access both to water supply and sanitation, it is important not to restrict this only to issues of distance to a source and density of users, but it further involves many aspects such as regularity, sufficiency, affordability, quality and safety.

Water supply and sanitation in India continue to be inadequate, despite longstanding efforts by the various levels of government and communities at improving coverage. The level of investment in water and sanitation, albeit low by international standards, has increased in size during the 2000s.For example, in 1980 rural sanitation coverage was estimated at 1% and reached 21% in 2008. Also, the share of Indians with access to improved sources of water has increased significantly from 72% in 1990 to 88% in 2008.

At the same time, local government institutions in charge of operating and maintaining the infrastructure are seen as weak and lack the financial resources to carry out their functions. In addition, only two Indian cities have continuous water supply and according to an estimate from 2008 about 69% of Indians still lack access to improved sanitation facilities. A study by Water Aid estimated as many as 157 million Indian or 41 percent of Indians living in urban areas, live without adequate sanitation. India comes top for having the greatest number of urbanites living without sanitation. India tops urban sanitation crisis, has the largest number of urban dwellers without sanitation and the most open defecators over 41 million people.

A number of innovative approaches to improve water supply and sanitation have been tested in India, in particular in the early 2000s. These include demand-driven approaches in rural water supply since 1999, community-led total sanitation, a public-private partnerships to improve the continuity of urban water supply in Karnataka, and the use of micro credits for water supply and sanitation in order to improve access to water and sanitation.

METHODOLOGY

The study is based on only secondary data which were collected from books, journals, government reports, websites and other data.

Objectives:

The general objective of the study is to identify the household expenditure for water and sanitation, hygiene and health problems in the city of Chennai.

However, the specific objectives of the study are:

1.To examine the patterns of water sources, supply, access to consumer, connections in Chennai city;

2.To analyse the household expenditure for water supply in Chennai;
3.To examine and analyse sanitation, hygiene, diseases and to identify indoor and outdoor risk factors in Chennai so as to suggest strategies for overcoming them.

WATER SOURCES

Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) is depending mainly on surface water, partly on groundwater and water from two desalination plants for its water supply to Chennai city. The main water sources for Chennai city are as follows:
1. Poondi, Cholavaram, Redhills and Chembarambakkam Reservoirs.
2. Krishna River water received in the Poondi reservoir through Kandaleru-Poondi Canal.
3. Veeranam Lake in Cuddalore District.
4. Desalination Plants at Kattupalli near Minjur (100 MLD) and Nemmeli near Mahabalipuram (100 MLD)
5. Ground water sources from Wellfields in the Araniyar-Koratalaiyar River Basin and from Neyveli aquifer.

WATER SUPPLY SERVICES

The abstraction from a water source, conveyance, treatment, storage and distribution of potable water, water intended to be converted to potable water and water for industrial and/or other uses, where such water is provided by or on behalf of a water services authority, to consumers or other water services providers is termed as water supply services. This includes all the organizational arrangements necessary to ensure the provision there is including amongst others, appropriate health, hygiene and water resource use education, the measurement of consumption and the associated billing, collection of revenue and consumer care.
Institutional arrangements in Chennai:
Depending on where one lives within Chennai metropolitan area, four distinct systems of water supply can be found in Chennai:
i) Supply of water by the Metro Water Board – mainly for Chennai City;
ii) Municipal supply – in 9 towns adjoining Chennai;
ii) Self-provision by many households and industries – by drilling of shallow wells or deep tube wells;
iv) Private market – (a) bulk supply by means of tanker trucks of 12, 000 litres capacity and (b) retail distribution of 'bottled water' in jerry cans of 10 or 12 litres capacity and water cans 25 litres capacity
Providing good quality water in adequate quantity to urban households in developing countries will reduce poverty and increase social welfare considerably. But the reality is that a large number of poor households do not have access to good quality water. When the government fails, the households will have to depend on alternative service providers to meet out their water needs. The increased demand accompanied by huge scarcity of water in urban areas leads to emergence of institutions such as private water markets. In recent years, the private operators are playing an important role in fulfilling the household water requirements in major cities like Chennai.
water in Chennai city has become a scarce economic commodity and even the poor end up shelling out a substantial amount of their income on it. Poor makes informal payment for the public supply; around 50 percent of them pay an additional amount for private water. Informal payment to the rent seekers suggests that poor households are willing to pay for ensuring existing public service, even though the quality is bad. Their preference towards private water suggests that they are interested to pay more for better quality service. However, when the improved public supply scheme is proposed, the level of keenness to participate and pay for it is found to be low as the private sector is already responding adequately to the changing preferences of the consumers. This implies that when a good service is already available from the private sources, preference towards improvements in the existing public supply may get suppressed. Apart from improving their existing service delivery system to serve the people better, the Government needs to regulate the informal water markets properly and monitor their functions adequately so that the informal markets could play an effective 'supplementary' role in fulfilling water supply needs of the people, including that of the poor (L. Venkatachalam).

ACCESS TO CONSUMER

In 2015, 88% of the total population had access to at least basic water, or 96% in urban areas and 85% in rural areas. The term "at least basic water" is a new term since 2016, and is related to the previously used "improved water source". In India in 2015, 44% had access to "at least basic sanitation", or 65% in urban areas and 34% in rural areas. In 2015, there were still 150 million people without access to "at least basic" water and 708 million without access to "at least basic" sanitation.
In earlier years, in 2010, the UN estimated based on Indian statistics that 525 million people practice open defecation. In June 2012 Minister of Rural Development Jairam Ramesh stated India is the world's largest "open air toilet". He also remarked that Pakistan, Bangladesh and Afghanistan have better sanitation records.

In 2008, 88% of the population in India had access to an improved water source, but only 31% had access to improved sanitation. In rural areas, where 72% of India's population lives, the respective shares are 84% for water and only 21% for sanitation. In urban areas, 96% had access to an improved water source and 54% to improved sanitation. Access has improved substantially since 1990 when it was estimated to stand at 72% for water and 18% for sanitation.

According to Indian norms, access to improved water supply exists if at least 40 liters/capita/day of safe drinking water are provided within a distance of 1.6 km or 100 meter of elevation difference, to be relaxed as per field conditions. There should be at least one pump per 250 persons.

In urban areas, those that do not receive water from the piped network often have to purhchase expensive water of dubious quality from private water vendors. For example, in Delhi water trucks get water from illegal wells on the banks of the Yamuna River for 0.75 rupees per gallon (about USD 2.70/m3).

Category	Quantity	Price (each)	Volume of sales (INR*)
250 ml sachets	5,000,000	INR 1/	5,000,000
1 litre water bottles	75,000	INR 10 -12	750,000 -900,000
12 litre cans	1,00,000	INR 18-30	1,800,000-3,000,000
20–25 litre cans	25,000	INR 20 and up	500,000 minimum
Tanker lorries (12,000 litres)	10,000	INR 700-900	7,000,000-9,000,000

Table 1. Water supplied by the private sector in Chennai (daily basis).

Source: Information gathered by the author from different sources including the South India Packaged Drinking Water Manufacturers' Association. *USD 1 ¼ approx. INR 45 (in 2010).

THE HOUSEHOLD EXPENDITURE FOR WATER SUPPLY IN CHENNAI

Inadequate access of basic services to the poor is one of the major problems ofurban India. The Government has undertaken a number of initiatives to provide basic services to the poor. However, it is observed that the public-sector agencies have not been able to provide the services. With the introduction of economic reforms in our country, there is a demand for improving cost recovery, increase in service charges and privatization in urban basic services. It is felt that these might price the poor out of the delivery system.

Many governments fear that fully recovering costs will hurt the poor, yet increasing prices to enable cost recovery in the delivery of services may actually help the poor (WDR, 1994), They often pay much higher prices per unit of water because they are not connected to public service networks that have lower unit costs, and because they do not benefit from subsidies to users of the public system - usually the better-off. Expansion of access benefits the poor by allowing them to rely on less costly sources of water.

To determine household expenditure for water in urban areas is a very complex process. Households, with house connection, may be willing to pay additional charge for improved pressure, quantity or quantity of water. Households without house connection may pay for improved public standpost or new house connection. In addition, the payments can be made in terms of one-time houseconnection and monthly water charge.

WHY USERS SHOULD PAY FOR WATER AND SANITATION?

- Available capital and public funds are inadequate to meet costs.
- State intervention and control has proven to be inefficient and ineffective
- Socio-economic benefits of improved water and sanitation service justify payment.
- Subsidies disempower users by denying them choice.
- Subsidies discourage cost-effectiveness and the development lose level of solutions
- Evidence of willingness to pay is strong as many poor people are already paying for services.
- Properly regulated user charges would mean the poor would pay less and get better service.
- Payments increase sense of value and commitment among users. Payments maximise the rise of available resources andimprove quality/standard of service.

PROBLEM OF WATER HEALTH

Water safety and quality are fundamental to human development and well-being. Providing access to safe water is one of the most effective instruments in promoting health and reducing poverty.

Water health believes that everyone deserves safe, pure and affordable drinking water regardless of their geographical location or economic situation. Yet, for several decades, about a billion people in developing countries have not had a safe and sustainable water supply. It has been estimated that a minimum of

7.5 liters of water per person per day is required in the home for drinking, preparing food, and personal hygiene, the most basic requirements for water; at least 50 liters per person per day is needed to ensure all personal hygiene, food hygiene, domestic cleaning, and laundry needs. A poor water supply impacts health by causing acute infectious diarrhoea, repeat or chronic diarrhoea episodes, and non-diarrheal disease, which can arise from chemical species such as arsenic and fluoride. It can also affect health by limiting productivity and the maintenance of personal hygiene.Finally, improvements in water supply are essential prerequisites for improved personal andhome hygiene and to enable sanitation facilities to be kept clean. Consequently, the directhealth effect of improved water supply is likely to be extended by its indirect effects on sanitation and hygiene.

FINDINGS AND SUGGESTIONS

Findings suggest that targeting subsidies to increase private connections amongst the low-income urban population would lead to financial savings, in addition to enabling a significant decrease in economic expenditure. While a pro-poor policy in rural area is more complex to achieve because of the prevalence of alternative water sources, it is not impossible. Should a pro-poor policy be developed for these areas, as a priority it would need to address the low functionality rate of formal sources in the dry season (to the benefit of all poverty categories) and provide strategic support—such as point-of-use treatment options—so that households may continue to rely on informal sources. These forms of self-supply are ways used by households to cope with over-crowded, distant or expensive formal water points—these will also need to be retained. Finally, an important issue uncovered by the research is the large proportion of population utilizing water sources whose water quality is not being monitored. This is clearly a public health risk that must be addressed along with the issue of water service affordability.

CONCLUSION

Poor environmental quality leads to individuals facing serious health risks in their everyday lives. Individuals will adopt measures to improve their environmental quality only if they perceive the associated health risks and if they can afford to pay for the prevention measure. It is the role of awareness as separate from the income constraint that we try to evaluate in this paper in the context of drinking water in urban India.

The existing system of drinking water in Chennai is not reliable in both services and quality to meet the requirements of the households. The study measures household expenditurefor improved water services and averting behaviour for quality improvement of drinking water. The results indicate that reliability of both water services and quality is of value to the households. Both services and quality are important such that households are willing to pay for improved water services and also adopts averting behaviour for improved water quality. For the household's household expenditurefor improved water services, the study estimates that there is statistically significant effect of location that in urban areas, households have more household expenditure for improved water services. The study also finds that sources of water have a significant effect on household expenditurei.e. the household who have own source are willing to pay in the higher range further tap water has significant effect on household expenditure for the first two quartiles. As expected, education level significantly affects household expenditurefor safe drinking water.

In averting behaviour strategies (Filters, Boiling, Chemical) for quality improvement, the study finds that there are statistically significant effects of education on the water purification behaviour of the households. Interestingly, higher income quartile is highly significant in all strategies, while in source of water people getting water from tap or fetch from outside, is highly significant in both boiling and chemical. But tap is significant in filter use at 10 percent level of significance. As expected, the study finds that there is a strong effect of quality (unfavourable taste, smell, appearance) on all water purification behaviour of households i.e. water quality is highly significant in all strategies. Apart from above variables, awareness has an effective role in influencing the general public perception towards the opportunity cost for using unsafe water.

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17. AN ANALYSIS OF AIR POLLUTION AND HUMAN HEALTH EFFECTS

Mrs. R. SHANMUGA PRIYA, M.A., M.Phil., M.B.A., Assistant Professor
Department of Economics, Chellammal women's college, Chennai, India
Mobile : 9500364757.E mail Id : shanmugapriya2629@gmail.com.

ABSTRACT
Hazardous chemicals escape to the environment by a number of natural and/or anthropogenic activities and may cause adverse effects on human health and the environment. Increased combustion of fossil fuels in the last century is responsible for the progressive change in the atmospheric composition. Air pollutants, such as carbon monoxide (CO), sulfur dioxide (SO2), nitrogen oxides (NOx), volatile organic compounds (VOCs), ozone (O3), heavy metals, and respirable particulate matter, differ in their chemical composition, reaction properties,emission, time of disintegration and ability to diffuse in long or short distances. Air pollution has both acute and chronic effects on human health, affecting a number of different systems and organs. It ranges from minor upper respiratory irritation to chronic respiratory and heart disease, lung cancer, acute respiratory infections in children and chronic bronchitis in adults, aggravating pre-existing heart and lung disease, or asthmatic attacks. In addition, short- and long-term exposures have also been linked with premature mortality and reduced life expectancy. This paper discussed about effects of air pollutants on human health.

KEYWORDS: Air pollutant; Human health; Environment.

INTRODUCTION
Although a number of physical activities (volcanoes, fire,etc.) may release different pollutants in the environment, anthropogenic activities are the major cause of environmental air pollution. Hazardous chemicals can escape to the environment by accident, but a number of air pollutants are released from industrial facilities and other activities and may cause adverse effects on human health and the environment. By definition, an air pollutant is any substance which may harm humans, animals, vegetation or material. As far as humans are concerned an air pollutant may cause or contribute to an increase in mortality or serious illness or may pose a present or potential hazard to human health. The determination of whether or not a substance poses a health risk to humans is based on clinical, epidemiological, and/or animal studies which demonstrate that exposure to a substance is associated with health effects. In the context of human health, ''risk'' is the probability that a noxious health effects may occur.

OBJECTIVES OF THE STUDY
1.To study the impact of air Pollution on Human health.
2.To Study the Air Quality of Indian scenario.
3.To obtain the knowledge and understanding necessary for developing preventive and corrective measures.

REVIEW OF LITERATURE
The World Commission on Environment and Development (WCED) opines that "the future is to face ever increasing environmental decay, poverty, hardship and an even more polluted world".

Aziz (1992) observes that urban environmental issues are tending to assume an important dimension especially in developing countries since there is a rapid increase both in the number of cities and in the urban population.

Nagdeve (2007) argues that both population growth and un-sustainable development are a cause for concern in India. Population size and growth tend to expand and accelerate these human impacts on the environment. The biggest concern is that the increasing population will grow to such an extent in future that it will cause overall scarcity of resources.

According to NEERI (2002) the share of PM10 in the metropolitan city of Mumbai is as follows: Transport: 32 percent, 45 percent from industry, 18 percent from area sources, and 5 percent from building and road construction.

Air pollutants do not only restrict their impact to causing impaired health conditions, but they greatly influence the global problem of climate change caused due to the release of the Green House Gases (GHGs). Mumbai being a coastal city and most of its population living in the lowlying areas, people will be greatly affected by climate change. (MCGM, 2011)

METHODOLOGY
This study based on secondary data. The data were collected from books, journals, magazines and published articles from leading journals.

AIR
The air we breathe is heavy with toxins. Air pollution is responsible for half the cases

of chronic coughing in urban children and facilitates the spread of respiratory infection. In the poor and developing countries, air pollution in the form of soot and smoke has increased. More than one billion urban residents worldwide breathe air that does not meet WHO air quality standards (Sharma, 2001). In developing countries, indoor air pollution is largely attributed to smoking and the use of biomass for cooking (Rehfuess et al., 2006).

This indicator provides a measure of the state of the environment in terms of air quality and is an indirect measure of population exposure to air pollution. The air we breathe contains varying levels of pollutants such as particulate matter, sulfur dioxide, oxides of nitrogen, ozone, carbon monoxide and volatile organic compounds derived from motor vehicles, industry, housing and commercial sources. Despite efforts to reduce pollution levels, they continue to pose risks to human health.

Epidemiological evidence shows that various health effects, including illness and death from respiratory and cardiovascular diseases, are associated with air pollutants. Exposure to air pollutants may lead to short-term effects such as reduced visibility, headaches, allergic reactions, irritation to the eyes, nose and throat, and longer term effects such as breathing difficulties, asthma and various chronic respiratory illnesses such as lung cancer and heart disease. Indoor air pollution is responsible for over 1.5 million deaths from Environment and Health Environmental Health Perspectives of a Panchayat in Idukki District of Western Ghats 15 respiratory infection per year and for 2.7 percent of the global burden of disease (WHO, 2006). In infants and young children, the effects can be far more (Smith et al., 2004). Children with asthma are believed to be particularly sensitive to air pollution. Air pollution may also act synergistically with other environmental factors to worsen asthma.

HEALTH IMPACT OF SPECIFIC AIR POLLUTANTS

Some of these gases can seriously and adversely affect the health of the population and should be given due attention by the concerned authority. The gases mentioned below are mainly outdoor air pollutants but some of them can and do occur indoor depending on the source and the circumstances.

→ ***TOBACCO SMOKE:*** Tobacco smoke generates a wide range of harmful chemicals and is a major cause of ill health, as it is known to cause cancer, not only to the smoker but affecting passive smokers too. It is well-known that smoking affects the passive smoker (the person who is in the vicinity of a smoker and is not himself/herself a smoker) ranging from burning sensation in the eyes or nose, and throat irritation, to cancer, bronchitis, severe asthma, and a decrease in lung function.

→ ***BIOLOGICAL POLLUTANTS:*** These are mostly allergens that can cause asthma, hay fever, and other allergic diseases.

→ ***LEAD:*** Prolonged exposure can cause damage to the nervous system, digestive problems, and in some cases cause cancer. It is especially hazardous to small children.

→ ***RADON:*** A radioactive gas that can accumulate inside the house, it originates from the rocks and soil under the house and its level is dominated by the outdoor air and also to some extent the other gases being emitted indoors. Exposure to this gas increases the risk of lung cancer.

→ ***OZONE:*** Exposure to this gas makes our eyes itch, burn, and water and it has also been associated with increase in respiratory disorders such as asthma. It lowers our resistance to colds and pneumonia.

→ ***CARBON MONOXIDE:*** CO (carbon monoxide) combines with haemoglobin to lessen the amount of oxygen that enters our blood through our lungs. The binding with other haeme proteins causes changes in the function of the affected organs such as the brain and the cardiovascular system, and also the developing foetus. It can impair our concentration, slow our reflexes, and make us confused and sleepy.

AIR POLLUTION IMPACTS ON RESPIRATORY HEALTH

In 2012 alone, 7 million deaths in the world were attributable to the combined effects of ambient (3.7 million) and household (4.3 million) air pollution (WHO, 2015). Ischemic heart disease is at the forefront in this ranking of causes, and COPD, lower respiratory infections, lung cancer are also amongst the top five causes of deaths worldwide. Table 1 presents data for every five years from 1990 to 2010 for the percentage of total global deaths due to causes attributed to air pollution categorized under three main diseases. As per the data observations, it can be said that the total global deaths due to all the major respiratory diseases seem to be reducing systematically for the time period in consideration. This is also due to the improvements made over these years, 1990 to 2010, in the quality, accessibility and availability of health services and medicines, that are being provided to the geographical areas where treatment from the illnesses are required. There is insufficient data to be able to state that the percentage of total global deaths that are attributed to air pollution have reduced over these years due to improvements in global air quality.

TABLE: 1

PERCENTAGE OF TOTAL GLOBAL DEATHS DUE TO CAUSES THAT ARE ATTRIBUTED TO AIR POLLUTION

Years	Chronic Obstructive Pulmonary Disease	Lower Respiratory Infections	Pneumoconiosis	Other Chronic Respiratory Diseases	Total
1990	6.7	7.3	0.4	0.6	15
1995	6.3	6.7	0.3	0.6	13.9
2000	5.7	6.1	0.3	0.5	12.6
2005	5.4	5.5	0.2	0.5	11.6
2010	5.5	5.3	0.2	0.6	11.6

Source: WHO 2015

INDIAN SCENARIO

Deterioration of India's air quality has been accentuated by industrialization and urbanization. While India's gross domestic product has increased 2.5 times over the past two decades, vehicular pollution has increased eight times, while pollution from industries has quadrupled. Household energy consumption also cannot be ignored in this respect. Households are a major consumer of energy and contribute, to a large extent, to the total energy use of the nation. At present, the share of direct energy use of households in India is about 40% of the total direct commercial and non-commercial indigenous energy use (Pachauri and Spreng, 2002). If, in addition, one takes into account the indirect or embodied energy in all goods and services purchased by households, then about 70% of the total energy use of the economy can be related to the household sector, the remaining 30% comprise the energy requirements of government consumption, investments and net imports (Pachauri and Spreng, 2002). The distribution of population with regard to energy consumption also shows that over 60% have a per capita total household energy requirement of less than 0.5kw per year. In addition to the wide disparities in the quantities of energy used, there are large variations in the types of energy used and pattern of consumption among households.

A survey by Central Pollution Control Board India (CPCB, 2000) has identified 23 Indian cities to be critically polluted. 12 major metropolitan cities in India produce 352 tonnes of oxides of nitrogen, 1916 tonnes of carbon mono oxides from vehicular emission and 672 tonnes of hydrocarbon. The CO, SO2 and NOx in the ambient air of India are above the WHO safe limit. WHO annual mean guidelines for air quality standards are 90 micrograms per cubic meter for total suspended particulates, and 50 for sulphur dioxide and nitrogen dioxide (World Development Indicators, 2000). The total urban air pollution of SO2 and NOx from major cities in India are 300 micrograms per cubic meter and 250 microgram per cubic meter during 2004 (World Development Report, 2005). Deterioration of air quality is a problem. A majority of the 300 million urban Indians, about 30% of India's population is directly experiencing this (Gurjar et al., 2008). Recently an Environment and Forest Ministry Report, Government of India, released on September 14,2007 has identified 51 cities that do not meet the prescribed Respirable Particulate Matter(RSPM) levels, specified under the National Ambient Air Quality Standards(NAAQS). In 2005, an Environmental Sustaibility Index (ESI) placed India at 101st position among 146 countries(Environmental Pollution in India,2008).

CONCLUSION

Air pollution is a serious environmental concerns all around the globe. Over the last few decades, the intensified process of industrialization and urbanization, coupled with rapid population growth has resulted in sever environmental degradation. In particular, harmful pollutants such as Sulphur Dioxide (SO2), Nitrogen Dioxide (NO2), Ozone (O3), Total Suspended Particles Matter (TSPM) etc, are emitted and these pollutants even exceed air quality guidelines recommended by the World Health Organization (WHO, 2005). This brief review presents the adverse effects of a number of (air) pollutants in human health. As shown, major impairments of different organs can be observed. The main conclusion drawn is that, in view of increased exposure of humans in a diversity of pollutants, dietary interventions, rich in plant-derived foods, may protect or decrease their effects on different organs.

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18. BIODIVERSITY TOOLS FOR BOOSTING IMMUNE SYSTEM OF HOMOSAPIENS: AN IN VITRO STUDY OF ABUTILON INDICIUM LEAVES

Dr.R.RAJ BHARATH, M.B.B.S., M.D., Assistant Professor of Transfusion Medicine, The Tamil Nadu Dr.M.G.R Medical University, Guindy, Chennai -600032.

ABSTRACT

Climate change is attributed directly or indirectly to human activity that alters the compositions of the global atmosphere. Human beings are both agents and victims of environmental change. Therefore, climate change is the main reason for the environmental challenge that the world faces today. To overcome these negative impact on human health, biodiversity has given powerful tools and healing powers in the form of plants and herbs for boosting human body's immune system which keeps homosapiens finally strong, hale and healthy. Many complex diseases including heart problems require long and expensive treatment which common man in developing countries cannot afford. India has a long history for the treatment of various diseases using traditional medicinal plants. In contrast to synthetic compounds, herbal products are safer with minimum side effects and preferred largely for the treatment of various ailments. Thromboembolism involving the arterial or venous circulation or arising from the heart is a common cause of morbidity and mortality. India with its numerous plants variety offers costless method and inexpensive treatment to a number of disorders such as thromboembolism. The present study explores how to find out the in vitro anticoagulant activities of abutilon indicium leaves extracts, in addition to comparing and contrasting the findings with other similar studies authored by a number of medical practitioners.

INTRODUCTION

Climate change has affected human beings all over the world irrespective of their level of economic attainment. However, developing countries in Asia, Africa and Latin America have suffered a lot and felt the climate change catastrophes to a larger extent since poor people in these countries do not possess sufficient income and wealth to protect themselves in terms of mitigation and adaptation measures against the vagaries of climate change such as heat waves, tidal waves and tsunami. Extreme disasters have led to human sufferings, diseases and impairment of immune system.

IMMUNE SYSTEM

Immune system is an interactive network of organs, cells and proteins that protect the body from viruses and bacteria or any foreign substances. The immune system works to neutralize and remove pathogens like bacteria, viruses, parasites or fungi that enters the body, recognize and neutralize harmful substances from the environment, and fight against the body's own cells that have undergone changes due to an illness. The cells of the immune system originate in the bone marrow, then migrate to guard the peripheral tissues, circulating in the blood and in the specialized system of vessels called the lymphatic system.

Human beings face illness when the performance of the immune system is compromised. Sub-normal activity of the immune system leads to severe infections and tumors of immunodeficiency while hyper-normal activity of immune system results in allergic and auto-immune diseases. Immune System has been categorized into two parts. They are as follows.

1. Innate Immune System: Innate immune system works as a general defense against pathogens.
2. Adaptive Immune System: Adaptive immune system targets specific pathogens.

These two immune systems complement each other to protect the body as well as in any reaction to a pathogen or harmful substance. Healthy immune function begins with good diet. Generally, obesity arises as a result of impaired immune response, so a plant based diet can support immune system in double ways; boosting immune system as well as keeping the body healthy. Following are some of the plant products available commonly, which will boost body's immune system

1.Garlic: Garlic is full of powerful molecules that can disinfect wounds besides preventing and fighting infections.

2. Onion: Onions enhance digestive system and immune system.

3. Cabbage: It has more antioxidant capacity.

4. Ginger: Ginger is a well known antibacterial food that has been shown to be more effective against bacterial staph infections than antibiotics. In addition, it kills cancer cells and resolves brain inflammations.

5. Green Tea: Green tea is a potent source of

antioxidants called polyphenols which can destroy influenza and common cold viruses.

6. Aloe Vera: Aloe Vera plant and its gel have the healing powers.

7. Citrus Fruits: Oranges and grape fruits packed with C vitamin , raise the body's resistance to infections.

8.Mushrooms: Mushrooms increase the production and activity of white blood cells, making them more aggressive and keeps immune system healthy.

METHODOLOGY

Climate catastrophes witnessed in the last few decades have culminated in a number of human disorders reducing the performance of immune system, besides increasing heart problems. Primary data and secondary data have been used to analyze the objectives and the related research question. The present study through a number of laboratory tests on human blood, tries to find out how Indian medicinal plants could be used as a costless method in the treatment of heart disorders instead of expensive allopathic treatment.

Thromboembolic diseases such as myocardial infarction, stroke, deep vein thrombosis, pulmonary embolism are the main causes of death worldwide. As thrombosis results from increased blood clotting, anticoagulant therapy is administered to counteract thrombosis. Chronic anti thrombotic therapy involves the use of anticoagulants, antiplatelets that are given either as mono-therapy or in combination for prevention of thrombotic complications. Rapidly acting parental anticoagulant such as heparin are used for prevention and treatment of thromboembolism and during revascularization procedures and the slow acting vitamin K antagonists are used for long term therapy. Heparin has been the mainstay of anticoagulant treatment for acute thrombotic disorders but has several side effects such as inefficiency in anti thrombin deficient patients, bleeding complications, heparin induced thrombocytopenia, immune-suppression and osteoporotic complications with long term effects. But these anticoagulants have certain serious side effects such as hemorrhage and also have a narrow therapeutic window. Limitations of these existing anticoagulants have led to the search for novel agents of natural origin.

REVIEW OF LITERATURE

The use of plants with medicinal properties for the prevention and treatment of diseases is one of the most ancient forms of health care. Plants contain several secondary metabolites that present many biological activities. Studies have been conducted which had shown the antiplatelet, anticoagulant and fibrinolytic activity in fruits and vegetables. Kee et al in his study on medicinal plants in South Africa found that the plant Leonotis leonurus root extract had anticoagulant activity. Ki Min et al found that algal fucoidan had thrombolytic activity and a stimulatory effect on the thrombolytic activity of Tissue-Plasminogen activator in a dose dependent manner in a murine arterial thrombosis model.

Studies in algae done by Shanmugam et al in South India found out sulfated polysaccharides presence which has the potential anti thrombin mediated anticoagulant activity. Abutilon indicum is an erect, velvety tomentose under shru, ranchlets with short stellate pubescent. Leaves are crenate-dentate and acute-acuminate. Flowers are golden yellow, solitary, schizocarps gloose, densely stellate-hairy, black when ripe. In Ayurveda, it is called atiala and in Siddha, it is called thuthi. The plant root, leaf, flower are used as cure for piles, ulcers, haematemesis, cough, leprosy, dysuria, leucorrhoea, jaundice and for other drug reactions. The leaves of the abutilon imdicium are used as diuretic and demulcent.

AIM

The aim of the study is to find out the in vitro anticoagulant activities in leaves of abutilon indicium extracts.

MATERIALS AND METHODS

Leaves of abutilon indicium were identified, collected, shade dried, powdered and aqueous extracts are prepared from the plant. They are then lyophilised into powdered form. Plant extract accounting for 0.1 gram were weighed in an electronic weighing balance and mixed with 1000 micro-litre of distilled water.

Blood samples were taken from volunteers and their blood grouping have been carried out. Then platelets were removed from the plasma and were separated based on the following blood groups A, B and O. Platelet poor plasma samples of 1 ml. each of A blood group of ten volunteers were pooled in a test tube. The same procedure has been repeated for B and O blood groups also.

Pooled plasma weighing 1000 micro-litres of A, B and O blood groups were mixed with 50 micro-litres of extract. For the control, another 1000 micro-litres of pooled plasma of A, B & O blood groups were mixed with 50 micro-litres of distilled water. The following tests carried out were prothrombin time, Activated partial thromboplastin time and Thrombin time in a semi automated coagulometer. The coagulometer was calibrated using the quality control standard reagent given for all the three tests. The following tests were run again with a higher concentration (0.2 grams) of the plant

extract in cases where the extract exhibited anticoagulant properties.

Results

ABUTILON INDICIUM (0.1 gm in 1000 µl)

Prothrombin time

BLOOD GROUP	CONTROL (in sec)	TEST (in sec)
A	12.4	12.6
B	12.5	12.6
O	10.1	10.0

Thrombin time

BLOOD GROUP	CONTROL (in sec)	TEST (in sec)
A	4.6	5.4
B	5.0	6.2
O	5.1	6.1

Activated partial thromboplastin time (0.1 gm in 1000 µl & 0.2 gm in 1000 µl)

BLOOD GROUP	CONTROL (in sec)	TEST (0.1gm)	TEST (0.2gm)
A	34.0	54.0	59.6
B	33.0	65.7	72.4
O	44.0	67.8	79.2

DISCUSSION

An ideal anticoagulant should have the following features such as effectiveness, safety and lack of serious toxicity, a wide therapeutic window, no need for monitoring, oral bio-availability, safety during pregnancy and low cost. It has been observed that heparin; the widely used anticoagulant has its own side effects and adverse reactions. This has led many researchers to search for the 'perfect' anticoagulant which has the capability of the highest therapeutic efficacy with no adverse effects.

Tests have been carried out on the controls of all the three blood groups A, B and O separately. Analysis revealed that O blood group had prolonged APTT compared to A and B blood groups. This may be due to the O group individuals having 25% lower plasma levels of Factor VIII and Von Willie brand factor compared to the other blood groups.. Factor VIII level play an important role in the intrinsic pathway and lower levels prolong the activated PTT.

The study has found out that the extract resulted in prolonged activated partial thromboplastin time (APTT) but not in thrombin time (TT) as well as in prothromin time (PT). The findings were comparable to another similar study by Rita et al. In their study on the same plant abutilon indicium, they have found out that aqueous extract of the leaves prolonged clotting time significantly. Anticoagulant activity of Phylanthus niruri linn was seen in the aerial and roots aqueous extracts which affected the intrinsic and common pathway of coagulation.

This prolongation of APTT occurred in all the three blood groups A, B and O respectively.. Juliana et al in their study on leaves of Jatropha gossypifolia showed significant activity in APTT but not in PT suggesting an action towards intrinsic and common pathway of coagulation. Similar study by Woo Jung et al revealed that fucoidan extracted from the plant Undaria pinnatifida prolonged the activated PTT significantly.

Tests have been carried out on the samples for APTT by doubling the concentrations from 0.1 to 0.2 gm per ml. of the extract. Findings have established that there was significant increase in the APTT on increasing the concentration of the dose level. This was again confirmed in all the three blood groups. Similarly, Caroline et al in their study on in vitro anticoagulant activity of the plant melastoma malabathricum linn. have observed that the plant affects the intrinsic pathway of coagulation cascade (APTT) and markedly prolonged, depending on the level of concentration but not in PT and TT. However, Karim et al in their study on evaluation of anticoagulant property of Morinda citrifolia extract have observed that it prolonged both the prothrombin and activated partial thromboplastin time to time.

There was however, no significant increase in blood PT in all the three blood groups. Manjappa et al in their study have established that the seeds of the plant Momordica charantia exhibited strong anticoagulant property in intrinsic pathway of blood coagulation and not in extrinsic pathway (PT).

There was no significant change in Thromin time(TT) in the present study which reflects the conversion of fibrinogen to fibrin but Wonhwa Lee et al in their study of plant cyclopia subternata have revealed that the active compound present vicenin- 2 prolonged PT, activated PTT and inhibited production of thrombin and factor X. Moreover, another study done in vivo of citrus lemon and punica granatum on rabbits by Azra et al suggested that they possessed anti- thrombin activity. However, caution should always be exercised when introducing new anticoagulants as therapeutic excesses can lead to bleeding risk and therapeutic limitations can increase thrombotic risk as well.

CONCLUSION

The leaf extract of abutilon indicium showed prolongation of activated partial thromboplastin time and normal levels in prothromin time and

time and normal levels in prothromin time and thrombin time. This confirms the anticoagulant activity of the plant in vitro by affecting the intrinsic pathway of the coagulation cascade. Therefore, the study establishes the value of plants as a tool of biodiversity in preventing health complications at a cheaper cost, suitable to the socio-economic conditions of common man in less developed countries. In the context of the above, the governments both at the centre and states should evince keen interest in promoting and propagating the use of medicinal plants through extensive research grants and permission to carry out both in vitro and in vivo test trials for establishing and authenticating the credentials of medicinal plants for the sustainable benefit and use of mankind.

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19. IMPACT OF WATER POLLUTION IN TAMIL NADU

Dr. J. JACOB STANLEY INBARAJ., Ph.D, Assistant Professor of Economics, Sacred Heart College (Autonomous), Tirupattur – 635 601.
Email: jacob@shctpt.edu
Mr. A. KANNAPPAN, II Master of Arts Economics, Sacred Heart College (Autonomous) Tirupattur – 635601. Email: kannaarun19@gmail.com.

ABSTRACT

Water resource is one of the important natural resources it essential for the survival of living organisms. The adequate safe water is essential to human lives and it is required in day to day life. Water pollution may take place due to natural causes such as silt carried by run-off, organic wastes of plants and animals, minerals leaching through soils, thermal pollution and algal blooms. In most of the developing countries are being polluted beyond their capacity because of high population growth. Increasing the urbanization and industrialization has reason for create a very large point of water pollution. Agro – based industries has seriously damaged surface water quality's, even in many rivers and groundwater has been contaminated. Polluted water is like poison for human beings. A large number of diseases in Tamil Nadu can attributed to drinking of sewage mixed water. Various diseases like polio, cholera, patches, jaundice, fever, viral fever etc are spread through polluted water.

KEYWORDS: pollution, contaminated, sewage, ground water.

INTRODUCTION

Water resource is one of the important natural resources it essential for the survival of living organisms. The adequate safe water is essential to human lives and it is required in day to day life. Water pollution may take place due to natural causes such as silt carried by run-off, organic wastes of plants and animals, minerals leaching through soils, thermal pollution and algal blooms. It may also be due to the discharge of domestic and industrial wastewaters. In most of the developing countries are being polluted beyond their capacity because of high population growth. Increasing the urbanization and industrialization has reason for create a very large point of water pollution. Agro – based industries has seriously damaged surface water quality's, even in many rivers and groundwater has been contaminated. Toxic chemicals used for agriculture and other purposes, solid wastes, oil from garages and cleaning of vehicles, drainage from farms and manure, land surface drainage, cattle washing, watering and dipping agricultural wastes, dust fall, wastes due to recreational use, intrusion of sea water and many more such activities cause pollution of water bodies.

In the state Tamil Nadu most of the rivers are affected due to sewage, oil, chemicals and effluents. The discharge of domestic waste and industrial effluents into water courses such as rivers, streams and lakes in Tamil Nadu results of physical, chemical and biological changes leads to undesirable condition. The growth of urbanization is lead to increase in industrial activity and dependence of the agricultural sector use on chemicals and fertilizers has leaded to pullulated ground waters. In different types water has polluted: surface water pollution, oil pollution, chemical water pollution, agricultural pollution, ground water pollution and thermal pollution.

RESEARCH METHODOLOGY

In this study based on explanatory research and adopt a secondary date. The data are collected from different journals, books, government annual reports and periodicals for the purpose of the study.

OBJECTIVES OF THE STUDY

1.To study the impacts of water pollution.
2.To study the water pollution control policies.
3.To examine the health impact due to contamination of water.

TAMIL NADU POLLUTION CONTROL BOARD (TNPCB)

Tamil Nadu pollution control board (TNPCB) was constituted by the Government of Tamil Nadu on 27th February,1982 in pursuance of the Water Prevention and Control of Pollution Act, 1974 (Central Act 6 of 1974). Increasing the pace of industrialization in Tamil Nadu its need to monitoring pollution level continuously. In the 3 industries are required to provide pollution control measures to meet the standards prescribed by the board. In the board field officers are inspect the industries continually with some pollution control measures provide by the industries sewage, trade effluent and emissions. For effective monitoring industries are categorized as Red, Orange, Green and White according to their pollution level. Also in the industries has been classified a large, medium and small scale based on the gross fixed

assets of the industry. And depending upon the category and size industries are monitored periodically.

The various legislations are created by the government to control the water pollution. Water pollution control legislations with which the TNPCB is concerned are given below. Most of the legislations are implements directly by the TNPCB and some of other legislations implemented by deportments of the government.

- The water (prevention and control of pollution) act, 1974 as amended in 1978 & 1988.
- Tamil Nadu water (prevention and control of pollution) rules, 1983.
- The water (prevention and control of pollution) cess act, 1977, as amended in 1991 and 2003.
- The water (prevention and control of pollution) cess rules, 1978 as amended in 1992.
- Coastal Regulation Zone notification, 2011.
- The Solid Wastes Management Rules, 2016.

MAJOR CAUSES OF WATER POLLUTION

It can be classified under two broad categories.

- Point source: which occurs when harmful substance are emitted directly into the body of water.
- Non-point source: which occurs when harmful substances are emitted directly into a body of water and 'nonpoint source' which delivers pollutants indirectly through transport or environmental change.

Important Driving Forces

The following are considered to be the major driving forces of water pollution.

1. Urbanization
2. Industrialization

Impact of water pollution in Tamil Nadu

INDUSTRIAL POLLUTION

In Tamil Nadu have a more than 3000 industrial units are classified under highly polluting or red category industry. In the red category industries total effluent generated around 6 lakh liters per day of which more than 5 lakh liters (85%) of total effluent generated by large scale industries. About 400 units discharge directly into rivers; of particular concern are the tanneries which are located in Vellore, Kancheepuram, Dindigul and Erode districts. The effluents have caused serious problems in the Palar basin. Similarly, there are a large number of textile bleaching and dyeing units in Tiruppur, Erode, and Karur, which have contaminated the Noyyal, Amaravathy and other water bodies. In majority of effluents come from main five industrial complexes in Tamil Nadu: Manali/Ennore, Ranipet, Cuddalore, Mettur and Tuticorin areas placed chemical, petro-chemical and other industries. These complexes have also become more environmental hotspots. There are cement units, distilleries, sugar, sago, paper, dairying, electroplating, chemical and fertilizers (Agro chemicals), mining industries, ores/ mineral processing industries and a variety of other industries which are water consuming and also generate large quantities of effluent. Some of the industries have also provided the treated effluent for irrigation with some degree of success.

COASTAL POLLUTION

The major activities that are responsible for coastal pollution in Tamil Nadu are discharge and disposal of untreated domestic and industrial wastes, discharges of coolant waters, harbour activities such as dredging, cargo handling, dumping of ship wastes, spilling of cargo's 3 chemicals and metal ores, fishing activities etc. There are 14 major industries located in the Ennore-Manali areas. The industries at Manali and Ennore are mostly chemical based, manufacturing petro-chemicals, fertilizers, pharamaceuticals, paints etc. There are two power plants at Ennore, namely, Ennore Thermal Power Plant with a production capacity of 200 MW and North Chennai Thermal Power Plant with a production capacity of 600 MW. The fly ash continuously deposits in the sea. The industries at Ennore-Manali are using a wide variety of raw materials and discharge waste products into the air, water or land as gaseous emissions, liquid effluents and sludge, respectively. In the coastal area of Tamil Nadu 488.02 MLD of wastewater is generated and only 226 of MLD is treated.

SEWAGE POLLUTION

The state Tamil Nadu out of 152 municipalities and 5 corporations, only 15 municipalities and 4 corporations have partial underground sewerage system. The river water is used downstream for irrigation or drinking by people/livestock, contamination of the river has increasingly become a serious problem in many of the river basins of the State. River basins like Palar, Tamiraparani, Cauvery, Noyyal, Bhavani and Amaravathy face serious pollution problems due to sewage.

RESPONSE

All the industries discharging effluents are regulated by the Tamil Nadu Pollution Control Board. In the board fixed the effluent standards in the industries. Industries pay a cess based on their water consumption to the Tamil Nadu Pollution Control Board. Most of the industries have a own effluent treatment plants. In small size industrial 109 pollution clusters, although the units are connected to common effluent treatment plants.

COMMON EFFLUENT TREATMENT PLANTS (CETPS)

Leather industry creates emission of high incidence is pollution affecting the ground water quality. In order to arrest the effluents of waste from the leather industries the board has been directing the leather industries come under the fold of common effluent treatment plants.in addition to the leather industry, textiles, dying, hotels and lodges are also bound to generate adverse externality. The common effluent treatment plant constructed in Nagalkeni near Pallavarm is showcasing the effective role of the TNPCB in abatement of water pollution.

IMPACTS OF HUMAN HEALTH

Polluted water is like poison for human beings. A large number of diseases in Tamil Nadu can attributed to drinking of sewage mixed water. Various diseases like polio, cholera, patches, jaundice, fever, viral fever etc are spread through polluted water. Polluted water contains lead which when consumed by the humans while drinking water leads to producing various aliments such as joint pains, kidney disease and heart disease in them.

The waterborne diseases are infectious which spread primarily from polluted water. Hepatitis, cholera, dysentery and typhoid are the common waterborne disease, which affect the majority of tropical area. If the polluted water gets stagnated, it becomes a breeding ground for mosquito and many other parasites which are very common in tropical areas. In children often get sick if they drink polluted water and sometimes they even die due to intensity of the diseases. Large amounts of chloride in drinking water deform the spine which becomes snaky and their teeth go yellow, start falling and more over their hands and feet lose flexibility of the bones and thieir body deforms. It also increases the risk of kidney diseases. A large amount of sulphide in polluted water is the reason of various respiratory diseases and drinking water contaminated with urea increases intestinal disorder. Thus continuous intake of contaminated drinking water is the reasons behind various stomach related disorders and other diseases like lumps in throat, tooth decay, etc.

Composition of nitrate resulting from fertilizer and chemicals used in agricultural lands, waste dumps or pit latrines causes contamination of the groundwater. Such contaminated drinking water is the reason of blue baby disease in kids which changes their skin colour. In this disease, nitrate contamination in groundwater results in decreased oxygen carrying capacity of haemoglobin in babies, leading to their death. Radioactive substances produced from nuclear explosions also reach the water bodies and makes drinking water severely contaminated. If one uses this water, one can fall a victim to terrible diseases like cancer. The use of such water also increases the risk of having children with disabilities.

CONCLUSION

Polluted water is like poison for human beings. A large number of diseases in Tamil Nadu can attributed to drinking of sewage mixed water. Its creates various diseases like polio, cholera, patches, jaundice, fever, viral fever etc are spread through polluted water. Tamil Nadu Pollution Control Board was following the Indian water pollution control acts, rules and notifications. The TNPCB officers inspecting the industries periodically with some pollution control measures. In the board monitoring the industries effectively and categorized a Red, Orange, Green and White according to their pollution level. In many of the Tamil Nadu river basins contaminates with industrial effluents. River basins like Palar, Tamiraparani, Cauvery, Noyyal, Bhavani and Amaravathy face serious pollution problems due to sewage. In the study concluded that urbanization and industrialization is the main reason for the water pollution its creates many diseases in human beings.

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20.CHALLENGES OF CLIMATE CHANGE ON HUMAN HEALTH

SHARON P.R, PhD Research Scholar, Bishop Heber College (Autonomous), Trichy -17.

Dr S. SEETHALAKSHMI, Assistant Professor, Bishop Heber College (Autonomous), Trichy-17

ABSTRACT

Climate change is the biggest global health threat of the 21st century. Climate change is adversely affecting the human health. Maximum impact of global warming and climate change will be seen on underdeveloped and developing countries like India. In Indian context the implications of climate change are broadly classified into rising sea levels, increasing CO2 levels, rising temperatures and extreme weather conditions. Climate change affects the human health in various ways. In developing countries like India, the health sector and the infrastructural facilities are very weak. The impact of the human activity on climate system is the most serious environmental challenge nowadays. The impacts of climate change on human health will be difficult to reverse in a few years or decades. Yet, these possible impacts can be avoided or controlled. This paper analyses the challenges of climate change on health.

INTRODUCTION

Climate change is a geological process which has been occurring throughout the planet's lifetime. The increase and decrease in atmospheric temperature has been happening at a low rate due to the changes in Earth's orbit. However the sudden climate change happening now can be described as earth's response to human activities which has caused an increase in the emission of carbon dioxide and other greenhouse gases. As the level of carbon dioxide in the atmosphere increases, the oceans are absorbing more carbon dioxide, making them more acidic and warmer. As oceans become warmer, they can expand and can aid in shrinking of glaciers and snow. This will further increase the atmospheric temperature as snow reflects heat into the space.

Drastic change in our atmospheric climate is having a wide scale impact on the economy by affecting many global sectors including agricultural sector and industrial sector. The global economy is further affected, due to the long term effects of climate change such as natural disasters and conservation of animal and plant species.

Populations of all animal species depend on supplies of food and water, freedom from excess infectious disease, and the physical safety and comfort conferred by climatic stability. The world's climate system is fundamental to this life-support. But today, humankind's activities are altering the world's climate. We are increasing the atmospheric concentration of energy-trapping gases, thereby amplifying the natural "greenhouse effect" that makes the Earth habitable. These greenhouse gases (GHGs) compromise, principally, carbon dioxide (mostly from fossil fuel combustion and forest burning), along with other heat-trapping gases such as methane (from irrigated agriculture, animal husbandry and oil extraction), nitrous oxide and various human-made halocarbons. To support this in further, the Fifth Assessment Report (2014) of the UN's Intergovernmental Panel on Climate Change (IPCC) stated: "There is a clear human influence on the climate. It is the dominant cause of observed warming since 1950s."

As humans are the primary cause of sudden changes in the planet's climate, it is important to understand that climate change is a significant threat to the health of present and future generation of our community. The impacts of human-induced climate change are increasing worldwide. Rising greenhouse gas concentrations have resulted in increased temperature, precipitation changes, increased frequency and intensity of extreme weather events, and rising of sea levels. These effects of climate change has shown its impacts on climate-related extremes including alteration of ecosystems, disruption of food production and water supply, damage to infrastructure and settlements, morbidity and mortality, and consequences for mental health and human well-being. According to the IPCC, there has been increased heat-related mortality and decreased cold-related mortality in some regions as a result of warming. As the climate continues to change, the risks to human health continue to grow. Another key finding from the Working Group II, Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) supports this by stating that health issues caused by climate change have occurred in the past and are currently occurring. Even with immediate reductions in greenhouse gas emissions, the health of our community will be

affected will continue to occur for at least the foreseeable future. For instance, the changes in temperature and rainfall have altered the distribution of water-borne illness and disease vectors.

The World Health Organisation (WHO) 2017 estimates that the climate change undermines access to safe water, adequate food, and clean air, explaining the approximately 12.6 million deaths each year that were caused by avoidable environmental risk factors. Between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year, from malnutrition, malaria, diarrhoea and heat stress, and in turn will need billions of dollars to cover the costs of maintaining a healthy community. The impact of global warming and the greenhouse effect is cited as the world's most serious environmental challenge.

Our personal health may seem to relate mostly to prudent behaviour, hereditary causes, occupation and local environmental exposures. However, environmental degradation and climate change represent one of the biggest threats to human health, particularly the health of younger people in future and that of future generations. Although global warming may bring some localised benefits, such as fewer winter deaths in temperate climates and increased food production in certain areas, the overall health effects of a changing climate are likely to be overwhelmingly negative – as it affects social and environmental determinants of health.

IMPACT OF CLIMATE CHANGE ON HEALTH

Climate change represents a fundamental threat to lives and wellbeing. Its effects are being felt most immediately and severely among those living in least developed countries and developing countries like India. However, ultimately the global population will be indirectly or directly affected by the drastic change in climate. The major climate changes are raising sea levels, increasing CO2 levels, rising temperatures and extreme weather – which are causing issues which affects the human health and quality of life.

Immediate action is now needed to protect health from climate change. This is recognised in the reference made in the Paris Agreement for the need to protect "the right to health", and for the need to hold global warming to well below 2 degree Celsius above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5 degree Celsius.

EXTREME HEAT EVENTS– EFFECT ON HEALTH

Climate change also affects human health by increasing the frequency and intensity of extreme heat events. Increase in the overall temperature of the atmosphere and oceans associated with climate change cause changes in the wind, moisture, and heat circulation patterns. These changes contribute to shifts in extreme weather events, including extreme heat events. Extreme heat events can trigger a variety of heat stress conditions, such as heat stroke. Heat stroke is the most serious heat-related disorder which occurs when the body becomes unable to control its temperature and eventually cause overheating. Extreme heat events (EHEs) cause dehydration which is defined as loss or deficiency of water in body tissues caused by sweating, vomiting and diarrhoea. Symptoms for dehydration include excessive thirst, nausea, and exhaustion. Furthermore, heat cramps can be described as a heat event in which painful and often incapacitating cramps occur in muscles. Symptoms for heat cramps include dry, hot skin, high body temperature (usually over 105F), and mental dysfunction; higher atmospheric temperatures are also linked to the increase respiratory illnesses present in the current global population. This is because higher temperatures contribute to the build-up of harmful air pollutants. These extreme heat events will lead to an increase in heat-related deaths and illness.

AIR QUALITY AND HEALTH

According to the National Climate Assessment, climate change will affect human health by increasing health problems, including diminished lung function, increased hospital admissions and emergency department visits for asthma and increase in premature deaths.

Climate change decreases the quality of the air we breathe. When we burn fossil fuels, such as coal, we release carbon dioxide (CO2), which builds up in the atmosphere and causes Earth's temperature to rise. This extra trapped heat disrupts many of the interconnected ecosystem in our environment. Climate change also affects human health by making our air less healthy to be inhaled. Higher temperatures lead to an increase in allergens and harmful air pollutants. For instance, longer warm seasons can mean longer pollen seasons – which can increase allergic sensation and asthma episodes, which will in turn diminish productive work. Exposure to allergens causes health problems for many people. When sensitive individuals are simultaneously exposed to allergens and air pollutants, allergic reactions often become

more severe. People with existing pollen allergies may have increased risk for acute respiratory effects.

Climate change can increase natural disasters such as wildfires at a larger scale, which will further reduce air quality and affect people's health in a number of ways. Firstly, smoke exposure can increases acute respiratory illness, leading to increased respiratory and cardiovascular hospitalisations, and medical visits for lung illnesses. Rising temperatures and wildfires and decreasing precipitation will lead to increases in ozone, a harmful air pollutant. This issue is being addressed by the Government of India by introducing compressed natural gas (CNG) for transport and replacement of wood fire for cooking by the liquid petroleum gas (LPG) in villages.

DISASTERS AND HEALTH

Globally, the number of reported weather-related natural disasters has more than tripled since the 1960s. The disasters include excessive floods, cyclones, storms, tsunamis, droughts and earthquakes. Every year, these disasters result in over 60,000 deaths - mainly in developing countries.

Climate change also affects human health by impacting the quality and safety of both our water supply and our recreational water. As the earth's temperature rises, surface water temperatures in lakes and oceans are also rising proportionally. Flood waters often contain a variety of contaminants as floods can overwhelm a region's drainage or wastewater treatment systems, increasing the risk of exposure to bacteria, parasites and other unhealthy pollutants. There is also loss of life and property. Increased coastal and inland flooding exposes populations to a range of short term and long term negative health impacts before, during, and after events.

VECTOR-BORNE AND RODENT-BORNE INFECTIOUS DISEASES

One way climate change might affect human health is by increasing the risk of vector-bone and rodent-borne infectious diseases. A vector is any organism such as mosquitoes, ticks, fleas, rodents, rats or ground squirrels when they carry diseases that can transmit a pathogen, or infectious agent from one host to another. Different insects can carry different diseases. As warmer average temperatures can mean longer warm seasons, earlier spring seasons, shorter and milder winters, and hotter summers - conditions might become more hospitable for many carriers of vector-borne diseases, with malaria and dengue being the most important. There is historical evidence of association between climatic conditions and vector-borne diseases. The development and survival of ticks, their animal hosts, and the bacterium that causes vector-borne diseases are all strongly influenced by climatic factors.

RAINFALL AND DROUGHT

Water is fundamental for life. Increase in precipitation extremes, either heavy rainfall events or droughts, can impact our health. Warmer temperatures cause more water to evaporate into the air and allow that air to hold more water. This sets the stage for heavier downpours. At the same time, global temperatures influence the way heat and moisture move around the planet, meaning drier conditions will occur in some regions of the world. Over the last several decades, we have already seen an increase in the number of heavy precipitation events in India. These events have contributed to more severe flooding in certain regions. Floods are one of the deadliest weather-related hazards. Living with poor air quality and damp conditions has been shown to increase health problems. These health problems include aggravation of asthma and other upper respiratory tract symptoms such as coughing and wheezing due to mould exposure. They also include lower respiratory tract infections like pneumonia. People living in drought conditions are more likely to encounter certain dangerous situations which can range from dust storms to flash floods. Wildfires associated with drought conditions greatly reduce air quality. This poor air quality affects people's health in a number of ways.

HEALTH EFFECT DUE TO FOOD INSECURITY

Food insecurity has been associated with health in variety of ways. Food insecurity refers to the lack of nutritious foods in sufficient quantities to maintain good health. Food insecurity and hunger have been associated with increased risk for poor nutritional status and poor health outcomes. Climate change can cause food insecurity as increasing temperatures and more variable rainfalls and loss of agricultural land are expected to reduce crop yields. This is further supported as the dynamic crop models indicate a decrease in the yield of crops as temperature increases in different parts of India. Children who are food insecure may be at higher risk for chronic health conditions, such as anaemia and asthma. Malnutrition causes number of deaths each year and it is one of the important public health problems. In India, almost half of the children under age five and more than two out of five women are undernourished.

MENTAL HEALTH AND WELL-BEING

The effects of global climate change on mental health and well-being are integral parts of the

overall climate-related human health impacts. Mental health consequences of climate change range from minimal stress and distress symptoms to clinical disorders, such as anxiety, depression, post-traumatic stress and suicidal thoughts. The social and mental health consequences of extreme weather events have been the focus of research for more than three decades. The mental health and well-being consequences of extreme events, particularly natural disasters are common and form a significant part of the overall effects on health. The cumulative and interactive effects of climate change, as well as the threat and perception of climate change, adversely impact individual and societal health, mental health, and well-being.

SUGGESTIONS TO OVERCOME CLIMATE CHANGE

→ Reduction in the use of fossil fuels
→ Use of renewable energy resources that do not emit Greenhouse Gases (GHGs)
→ Reducing deforestation
→ To raise the awareness on climate change
→ Institutionalisation of disaster risk reduction approaches
→ To limit the growth of population
→ To plant more trees
→ Recycling of waste materials
→ To use bio-technical methods like bio-gas and bio-diesel etc
→ Reduction of plastic materials

CONCLUSION

According to World Health Organisation (WHO), "health is defined as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". In this regard, this paper shows the linkages between the climate change and human health. The climate change is now a mainstream issue affecting the human health. There are important mechanisms in which climate change can affect population health: through extreme heat events, air quality, disasters, vector-borne and rodent-borne infectious disease, rainfall and drought, food insecurity, mental health and well-being. These climate changes are affecting quality of human health directly and indirectly. Even the developed nations are struggling to cope up with the challenges posed by the changing climate; hence concluding that India needs to put more efforts to counter the same. Moreover, the longer we wait to reduce the causes of climate change, the more expensive it will become. By concluding this article it is vital to understand that the government policies alone will not be able to make a large impact on the climate change. Our day to day activities should also be altered to being eco-friendly.

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21. CLIMATE & ENVIRONMENTAL CHALLENGES: OWARDS ALTERNATIVE THEORIES OF DEVELOPMENT

RUDRAPPAN, D., President, AMECA, Former Joint Director of Collegiate ation, Govt. of Tamil Nadu, Ethiopian Civil Service University, Ethiopia l: drudrappan@gmail.com

VEERAMANI, Organizing Secretary, AMECA, Associate Professor, Department nomics, DRBCCC Hindu College, Chennai.E-mail:drsvmani@gmail.com

the human species, are confronting a ry emergency-a threat to the survival of lization that is gathering ominous and tive potential-----; but there is hopeful s well; we have the ability to solve the nd avoid the worst though not all of its uences, if we act boldly, decisively and '.-

Vice-President Al Gore, Noble Lecture December 10, 2007.

RACT

esent day global economic problems brought new attention to chronic ral flaws in current economic models umptions. As world economies struggle ver, many are taking a closer look at the tive theory of economic development ne that simultaneously promotes ability and economic growth. Welfare of sapiens is inextricably linked to earth's . The manner in which human beings d to climate change is critical not only ival but also to their well-being. It is a ble fact that current economic growth world is based on high resource-use gh carbon-use industries which result uction and accumulation of unwanted house gases beyond tolerable limits of carrying capacity leading to formation s in the ozone layer. Climate change is rful force in shaping the life chances of d people and climate related risks are a cause of human suffering, poverty and d opportunity which will lead to large uman development reversals in third countries particularly Asian and African es. Though the real output of African es are growing at an annual average about 5.8%, there are indications that rrent pattern of growth may not be able, because it is based on the use of newable or exhaustible natural resources s not been associated with increases in ment. Unbridled economic activities, ned industrialization, population on and ill-planned urbanization have nimaginable increase in global warming perpetuating climate risks and tragedies.

Climate shocks pose many undesirable consequences such as threats to health and nutrition, loss of savings and assets, damage to property, and loss of crops. The short term and long term cost of extreme climate events can have devastating consequences for human development. In the race for rapid economic development among all countries, environmental concerns are often neglected. The paper discusses vividly not only the calamity that will be caused by green house gases and their consequent effects on earth, human development and the economy but also offers climate change compatible development paradigm which will go along with climate adaptation and mitigation strategies for sustainable development. Thus, climate compatible development path has necessarily become an alternative paradigm of development embracing economic, social and environmental issues not only for meeting the needs of resource use of the present generation but also of the future generation as well.

INTRODUCTION

The persistence of chronic poverty and degradation of the environment can be traced to a sequence of market and institutional failures that make the existing economic theories far less efficient than it otherwise would be in advancing sustainable development goals. These market and institutional failures are well known to economists, but little improvement has been made to address them. For example, there are not sufficient mechanisms to ensure that polluters pay the full cost of their pollution. There are "missing markets" – meaning that markets do not systematically account for the inherent value of services provided by nature, like water filtration or coastal protection. A "market economy" alone cannot provide public goods, like efficient electricity grids, sanitation or public transportation. And economic policy is often shaped by those who wield power, with strong vested interests, and rarely captures the voice and perspectives of those poor people, mostly at risk.

Even as early as 18th century, Classical economists particularly Malthus expressed concern over increasing pressure of population and its consequent threat to food security and other natural resources. However, mainstream classical economists downplayed the importance of the natural environment factors in the process of economic development. In the race for rapid economic development among all countries following neo-classical market driven development theory since 1980's, climate and environmental concerns are often neglected. As a result, climate and environmental risks pose threat to health, nutrition and life, damage to property and loss of assets and crops all over the world. Under business as usual scenario, high consumption fossil-fuel based development path disturbs ecological balance, brings man made calamities and further can hasten the seismic / geological processes such as tsunami which may result in catastrophic destruction of earth's eco-systems threatening the future of mankind. The short run and long term aggregate cost of extreme climate hazards can have devastating consequences for human development. The Global Climate Convention, 1992 at Rio de Janeiro declaration requested the world countries to protect the climate system for the benefit of the present and future generations of humankind, on the basis of equality and in accordance with the common but differentiated responsibilities and respective capabilities. Besides discussing climate change calamities and other development theories such as Inclusive and Sustainable Globalization, the paper offers climate change compatible alternative paradigm of development which will be in sync with climate change adaptation, mitigation and coping strategies paving the way for sustainable development as laid down by the World Summit on Sustainable Development at South Africa. Climate disasters as seen above have been increasing in frequency and intensity affecting lives of many millions, particularly people living in poor countries. The catastrophic development setbacks are avoidable and the ability to control climate change is linked with the theories of economic development pursued by different countries for their development as explained below. Thus, climate compatible green economy and green growth path has necessarily become an alternative development theory embracing economic, social and environmental issues not only for meeting the needs of resource use of the present generation but also the future generation as well.

ALTERNATIVE ECONOMIC DEVELOPMENT THEORIES

Climate changes have complex relationships with economic variables such as consumption, production and distribution. The global climate change has paradigm shifting implications for development theories which remain aligned with various schools of economic thought in the last fifty years. Even as early as 18th century, Malthus expressed concern over increasing pressure of population and its consequent threat to food security and other resources. Neo-Malthusians argument also hovers around population pressure and the accompanying increase in human activities which would lead to resource scarcity and competition over the scarce means to sustain livelihoods. Extreme climate related events such as drought, flood and rising sea level would force the people to migrate to other areas as environmental refugees leading to human development reversals and greater competition and conflicts for the available resources in destination areas. However, optimist economists have argued that improvements in technology and efficiency would outstrip the constraints imposed by increased population while at the same time environmental degradation affects human wellbeing negatively. IPCC as well as UNDP reports have confirmed that global warming is caused by increased human activities such as excess fossil fuel consumption and deforestation. Therefore, this section discusses cardinal features of three main development theories relating to climate change.

NEO-LIBERAL DEVELOPMENT THEORY

Orthodox neo-classical market driven development policy followed by countries all over the world since 1980's has been based on two distinct features namely, growth of national income and high energy consumption. However, consequent climate catastrophes which have been witnessed so far have taken place as a result of high fossil fuel consumption and have necessitated the dire need for evolving an alternative paradigm of climate compatible development path. Neo-liberal policy has treated environmental effects of economic growth as externalities and ignored them until reaching a threshold level of income. Instead of integrating and balancing the objectives of national income growth and bio-physical resilience, the neo classical model emphasized mainly on income growth through market forces and policy tools such as liberalization, privatization and globalization which have resulted in foreign direct investment (FDI) led growth rather than broad based industrial

growth using endogenous productive capacity. Neo-liberal economic policies have apparently favored Trans National Corporations (TNCs) and foreign investors with more incentives such as tax holidays and non-insistence of environmental conditionality for the operation of TNCs, over-riding the interests of domestic manufacturers. The undue emphasis placed on the principle of comparative advantage in foreign trade under this policy has led to specialization of production in mono culture primary products rather than diversified agricultural products, low wage in manufacturing and extractive industries and jobless economic growth which are not conducive for the development of poor countries (Rudrappan, 2004). The Ramsey-Cass- Koopmans growth model formulated on the basis of neo-classical model of Solow-Swan, emphasized physical capital based economic growth but it is also less sensitive to climate change effects.

ECONOMIC DEVELOPMENT AND ENVIRONMENTAL DEGRADATION: AN INTERNATIONAL EXPERIENCE

A widely discussed concept under neo-classical theory is that of Environmental Kuznets Curve which shows that as per capita income increases, environmental quality initially worsens but with continued increase in income, environmental quality starts improving, giving rise to an inverted 'U' shaped curve. Another reason attributed is that as economic development progresses, there tends to be a parallel progression in environmental regulation as one goes from little or no regulation at low levels of development to strong environmental regulation at high levels of economic development highlighting the enhanced role of institutional development and property rights. (Yandle et al, 2004) Ignoring safe ecological limits under the neo classical theory of development will increase the risk of undermining long run prospects of development in the world as attested below by the IPCC report. Climate disasters have been increasing in frequency affecting the lives of many millions of people. Between 2000 and 2004, nearly 326 climate disasters occurred affecting some 262 million people on an average per annum. While climate disasters affect 98 per cent of people living in poor countries, the economic impact and losses have been reported mainly in rich countries on the basis of estimated insured losses as well as higher property values.

In view of the above, it is observed that the neo-liberal policy has several deficiencies as a result of which climate stability could not be restored through climate change mitigation and adaptation strategies. Focusing only on growth of income, old development theory has neglected sustainable livelihood of human beings, overlooked environmental sustainability and ignored sustainability of resources and the phenomenon of jobless growth. (Chang, 2009) Furthermore, the neo-liberal paradigm has treated climate and the natural environment as exogenous to economic forces and this has resulted in several social, economic and environmental disorders leading to the formulation of the following inclusive and sustainable globalization theory of economic development.

INCLUSIVE AND SUSTAINABLE GLOBALIZATION THEORY

Emphasizing on environmental standards and best practices in all the production, distribution and marketing activities of TNCs along with many other features of market economy, the World Bank President Robert Zoellick has favored inclusive sustainable globalization model with a pro-active government promoting and integrating local producers in the process of global supply chain. (Zoellick, 2008) In addition to stressing the role of public-private partnerships (PPPs) in promoting sustainable development objectives which have been formulated at the 2002 World Summit on Sustainable Development, Johannesburg, this model also favored Washington Consensus strategy of achieving economic growth with a human face, targeting mainly the poorest among the poor in developing countries. (WBCSD, 2007)

However, in the context of shortcomings of this model such as "neutral" industrial policies, this model also has had limited results in developing broad-based sustainable growth at the local region which is essentially required for resolving the challenges posed by climate risk and vulnerability. Therefore, an alternative paradigm of development has been formulated subsequently to cope with climate uncertainty along with its associated risks and vulnerability.

CLIMATE COMPATIBLE NEW PARADIGM OF DEVELOPMENT

Contributions of Alice Amsden, (2003) Chang, (2009) Johnson, Lyuba Zarsky, Robert Wade and Sharukh Rafi Khan (2011) have advocated a new development agenda and they tried to create virtuous cycles of prosperity in the place of vicious cycles of poverty through the process of institutional development. Besides emphasizing on higher growth of national income with emphasis on social justice, the objective of the new paradigm is to encourage endogenous productive and technical capacity of socio-economic and institutional structure with a pro-active industrial policy pursued by the government for transformation and

diversification of the economy so as to capture the benefits of global market economy both in domestic and foreign trade. (Rodrick, 2007) While focusing more on overcoming market failures which inhibit economic development, climate compatible model advocates government's strategic role in partnership with TNCs to promote quality foreign direct investment (FDI) in industrial development in low carbon and zero carbon green energy sources which will promote employment. The model not only restricts investment in high resource-use, high energy-use and industries which results in high pollution but also encourages mobilization of domestic savings for channeling it into investment in local broad based productive capacity based on sustainable livelihood, sustainable resource use and environmental protection with cleaner production processes. It is pointed out further that this type of investment will pave the way for the promotion of social solidarity coupled with economic and environmental sustainability.

Among the three development models discussed, the above climate resilient development model has been found robust since it contains critical components namely economic growth, social equity and environmental sustainability and designed to go along with climate change mitigation and adaptation strategies because of its sound features of building an endogenous productive capacity with an inclusive growth and a strong role for the government which alone will enable carbon neutral development trajectory reducing climate risks and vulnerability. The truth is that in the race for rapid economic development among the world countries, environment is often neglected. As a result major environmental challenges faced so far were forest and agricultural land degradation, resource depletion such as water, mineral, forest, sand, rocks, environmental degradation, public health, loss of biodiversity, loss of resilience in ecosystems and the livelihood security of the poor.

Climate change is global but its effects will be felt at the local level. Extreme climate events threaten developing countries more intensively because these countries lack sufficient financial and technical capabilities to manage climate risk. Addressing these needs will not be easier for developing countries as development will get harder with climate change. The forces generated by climate change will be superimposed on the world marked by deep and pervasive human development deficits and disparities that divide the 'haves' and 'have not's. IPCC projections show that the resilience of many ecosystems will be undermined by climate change. With the increase in temperature beyond 20 C, the world will be facing unprecedented losses of biodiversity and the collapse of ecological systems which are intrinsically bad for both human and economic development during the 21st century. To avoid this, it is essential to adopt climate resilient development through green energy sources which are not only renewable and job generating, but also sustainable with a higher environmental benefit.

CONCLUSION

There are ways of addressing persisting poverty and income inequality among 2.5 billion people of the world in the context of environment and climate change. Lack of economic opportunities forces people to exploit the natural resources around them unsustainably, leading to destruction of forests and other carbon sinks. Income poverty leads to inefficient use of energy in households, and the absence of electricity and clean fuels for the household use drastically reduces the productivity and socio-economic well being of the people. This can be overcome by combining poverty eradication and development projects with climate change mitigation programs. Investing in these green energy technologies which are sustainable in the long run will generate millions of jobs, revive the economy and bring overall socio-economic development. Thus, eradicating poverty and reduction of income inequality through the alternative paradigm of development can also be made a part of climate change mitigation action.

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22. A STUDY ON AIR POLLUTION AND ENVIRONMENTAL CHALLENGES IN CHENNAI CITY

R. DHANALAKSHMI, Ph.D Full Time Research Scholar Department of Economics, Presidency College of Chennai – 600 005.

ABSTRACT

Environmental pollution is a severe issue in both developed and developing countries. Pollution is defined undesirable state of natural environment being contaminated with harmful substances as a consequence of human activities. There is clear relationship between the growth manmade green house gas emissions and observed environmental climate change are claimed by policymakers. The most important causes of air pollution are human economic activities such as use of vehicles and industrial operations mainly in Chennai city. Air pollution is various types such as noise, water, air. It causes damages that are normally inflicted in society at large rather than on those directly responsible. In several city air is already polluted that it has been causing illness and deaths among elderly people and children. The high pollution density has placed great strain on available infrastructure and major problem for environmental in major cities of Tamil Nadu. It is recognized that climate change due to global warming going to important threat safety of millions of people not only living near coastline but also impacts on changing cyclones. The aim of the study focuses on objectives to environment in Chennai city to estimate the problems of air pollution environment in Challenge in Chennai city and suggest health cost of vehicular pollution and to suggest the Government measure to control air pollution in environment Chennai city.

INTRODUCTION

Environmental pollution is a global phenomenon experienced by economically advanced as well as developing countries. Due to urbanization there is a problem of environmental pollution congestion, transportation etc. In several cities air is already polluted that it has been causing illness and death among elderly people and children. Environmental challenge is to deal with carbon dioxide the emission can include various toxic and carcinogenic chemicals and fibers, photo chemical pollutants, lead and carbon monoxide which is harmful to human health. Rapid and uncontrolled growths of mega cities in India have lead to the problems of increasing slums vehicular traffic and air pollution.

Environmental pollution is classified into various groups. For instance, pollution of air is termed as the atmospheric pollution, the pollution of hydrosphere or water is termed as water pollution, while pollution due to disposal of waste water is termed as industrial effluents pollution, Indian cities also have serious problem of noise pollution.

OBJECTIVES OF THE STUDY

- The objective of study is to focus the environment in Chennai city.
- To estimate problems of air pollution environment in Chennai city.
- To suggest growth of population health cost and cost of time in Chennai city.
- To control the Government measures to control air pollution environment Chennai city.

METHODOLOGY

The data based on secondary sources. The necessary secondary data have been obtained from various published works such as books, reports, sound, articles, magazines, periodicals and electronic web materials. In addition to this the researcher has made use of the data and other information pertaining to air quality, pollution and health conditions. Secondary data are derived from documents and files of Tamil Nadu pollution control board and internets.

The table given below shows decadal growth of population in Chennai city. With the increase in population the harmful effects of pollution tends to increase. Health costs of vehicular pollution in Chennai increases air pollution this leads to cost of time working peoples.

THE FOCUS OF AIR POLLUTION IN CHENNAI

Air pollution may result in negative effects such as global warming, respiratory and heart complicatory acid rain, destruction ozone layer and natural habitats.

VEHICULAR POLLUTION

Transport activities have a wide variety effects on the environment challenge such as air pollution, noise from road traffic. The different factors are types of engines used, the age of vehicles, poor road conditions and congested traffic in Chennai. The principal vehicular pollutants are carbon monoxide, oxide of nitrogen, hydrocarbons suspended particulate matters, a varying amount of sulphur dioxide, depending on sulphur content of fuel and lead compounds.

ENVIRONMENTAL PROBLEMS OF AIR POLLUTION IN ENVIRONMENT CHENNAI CITY

Air pollution in Chennai cities has increased

more and more people crowded the city.

RESPIRATORY AND HEART PROBLEMS

The effects of air pollution are alarming. This leads to several respiratory and heart conditions with cancer among body some of them direct or indirect effects of air pollution in millions.

ACID RAIN

Another direct effect in Chennai is immediate alterations due to Global Warming like acid rain. Harmful gases like nitrogen oxides and sulphur oxides are released into atmosphere duty burning fossil fuels.

GLOBAL WARMING

Global Warming also adversely affect human health leading to increases in heart related diseases and death.

To suggest health cost vehicular pollution table population growth and cost of time table.

TABLE 1 : GROWTH OF POPULATION IN CHENNAI CITY 1901 – 2001

Component	City Population	Area in sq. Km	% Annual growth rate in lakhs	Population density per/sq. km
1901	5.41	68.17	_	8000
1911	5.56	68.17	0.26	8200
1921	5.78	68.17	0.41	8500
1931	7.13	68.17	2.12	10500
1941	8.65	77.21	0.69	11200
1951	14.27	128.83	0.22	11100
1961	17.49	128.83	2.06	13600
1971	26.42	128.83	3.93	20000
1981	32.84	176	0.41	18700
1991	38.84	176	1.58	21800
2001	43.44	176	1.23	24700

Source : Census of India 2011

Table explains the population growth, area, growth of population and density of population. It is estimated that the total population of Chennai city stood at 5.41 lakhs in 1901 but it was increased to 7.13 lakhs in 1931 due to migration of people from various parts of the country to Chennai city and to seeking employment opportunity and better education. Subsequently, the total population has grown up to 14.27 lakhs in 1951 and 17.49 lakhs in 1961. It is estimated that the Area of population in Chennai city stood at 68.17sq. km in 1901 but it was increased to 77.21 sq. km in 1941 due to migration of people from Chennai city. Subsequently to area of population has grown up to 128.83 sq. km in 1951 and 176 sq. km to 2001. It is confirmed that urban population in Chennai city has increased. Since 1981 to 2011 which account for 176 sq km population. It is estimated that the population density in Chennai city stood at 8000 lakhs in 1901 but it was increased to 2.12% Annual growth rate increased in 1931 due to annual growth rate and population density of Chennai city. Subsequently, Annual growth rate 3.93 lakhs in 1971, population density 20000 sq km increased.

It is confirmed that urban population in Chennai city has tremendous increased. Since 1971 to 2011 which account for 26.42 lakhs to 43.44 lakhs. The growth of urban areas influences the growth of population meantime. The city faces many urban problems such as housing, water, sanitation and pollution. Therefore, due to increase the urban population the number of vehicle increases as a result, the vehicle emits large number of chemical in the air. However the urban population creates severe air pollution by the ways of vehicles. Hence we have to reduce population to reduce pollution.

The above table 2 shows that the health costs are incurred by the people who affected by the air pollution increases due to the number of taxi increases which accounts for 13.28 were due to pollution emitted at 8.95 for CO, 29.61 for NOX. The health cost are incurred by the people who affected air pollution increases due to number of bus increases.Which account for at 1.91 for CO, 1.44 for NOX total pollutant 78.01 were due to pollution emitted at 37.44 for CO, 35.72 for NOX. It is confirmed that the urban population in Chennai city is increasing total health costs and total pollutant. Therefore, due to increase the urban population vehicles are increased as

result, vehicle emit large number of chemicals in Air. However the health cost of vehicular pollution creates severe Air pollution by the way of vehicles. So we have to reduce vehicles without air pollution.

TABLE 2 : HEALTH COSTS OF VEHICULAR POLLUTION IN CHENNAI

Estimated Emission Tonnes Per km/day Estimated for 2008 (Based on CCTS Data)					Estimated Health Damages (for 2008-2009) in Rupees crores				
Health Costs (Rs/Kg) Based Sengupta etal (2005)	**CO**	**NOX**	**HC**	**PM**	**CO**	**NOX**	**HC**	**PM**	**Total Health costs**
Two Wheeler	7.23	0.28	4.68	0.20	0.03	0.26	0.28	1.48	2.05
Car	2.33	0.60	0.38	0.09	0.01	0.56	0.02	0.69	1.28
Auto	6.86	0.04	4.53	0.15	0.03	0.04	0.27	1.17	1.50
Taxi	10.16	3.75	0.74	1.28	0.04	3.51	0.04	9.69	13.28
Bus	8.95	29.61	2.48	3.76	0.04	27.72	0.15	28.45	56.36
Other Modes	1.91	1.44	0.23	0.29	0.01	1.35	0.01	2.16	3.53
Total by Pollutant	37.44	35.72	13.04	5.77	0.15	33.44	0.77	43.64	78.01
Source : Computed by authors based on CCTS (2010) Velmurugan (2005) and Sengupta e tal (2005).									

TABLE 3 : COST OF TIME

Vehicles	Work	Business	Education	Others	Modal Share
Two Wheeler	0.53	1.06	0.26	0.26	26
Car	1.08	2.16	0.54	0.54	7
Auto	0.35	0.7	0.15	0.11	6
Taxi	0.42	0.84	0.21	0.21	30
Bus	0.32	0.64	0.16	0.16	27
Train / Metro	0.5	0.99	0.25	0.15	4
Total by purpose	47.99	19.79	6.53	67.05	0.54
Source : Value to Time by Nature Work and type CCTS (2010) data indicates estimates computed by authors based weighted average.					

The above table shows that the cost of time Two wheeler, Car in working condition 1.08 increased in 2.16 in business peoples in economy of Chennai city. Likewise business people in Chennai city Train/Metro increase to total by purpose 19.79. The problem in vehicles of Chennai city to working peoples and Business peoples in cost of time lead to population in Economy.

The education in cost of time leads to 0.26 in others 0.54. The model share of cost of time in 26 Two wheelers is cost of time increasing 30 in Taxi. This is cost of time increase in vehicles resulted increasing in working condition. Therefore we have to reduce air pollution the cost of time decrease.

STEPS TAKEN BY THE GOVERNMENT TO CONTROL POLLUTION

Enforced special measure taken

1.The Supreme Court has also banned the registration of luxury SGVS and diesel cars above 2000cc in the national capital. Diesel cars are believed to major source of vehicular emissions.

2.The Delhi Government prepared odd/even rule where odd numbered registration plates would even dates. This is to reduce congestion well to reduce pollution resulting vehicular emissions.

3.The top court ordered taxis plying city must convert CNG from March next year.

MEASURES TO CONTROL AIR POLLUTION

In Chennai, pollution is not simple as prevention of air pollution. Fuel selection and utilization process change or equipment site selection and zoning control of aerosol emission. Zoning is a control measure based upon knowledge mechanics of atmosphere.

LEGAL CONTROLS

Technical and scientific knowledge alone is not sufficient in controlling air pollution administrative control of atmospheric pollution can be most effectively developed into laws national level public health administration, industrial hygiene, fuel usage, agriculture, science, industry and urban areas through the formation of committee representing.

CONCLUSION

There are several simple things that people can do daily basis to minimize impacts on environment challenge in Air Pollution. All types of environmental pollution have negative impacts on human health and types of pollution challenging in Chennai. The impact of environmental systems of the country well as global eco system. The growth of population increases in Chennai due to vehicular air pollution and cost of time for working people in environmental challenges in Chennai city. The carbon monoxide, nitrogen oxides and sulphuric acid are causes threat to human life. Thus Government International Organisation and Committees must work together. Each and every person must ensure the work economically in environmental challenge to sustainable.

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23. IMPACT OF AIR POLLUTION IN TAMIL NADU

A.PREMKUMAR, II MA Economics, Sacred Heart College (Autonomous), Tirupattur. Premkumar1074@gmail.com.

T.VINOTH, II MA Economics, Sacred Heart College (Autonomous), Tirupattur. Vinosdb123@Gmail.com.

ABSTRACT

This paper outlines the impact of air pollution in Tamil Nadu. Air pollution is the any form of solid, liquid and gaseous substance present in the atmosphere that may or tend to be injurious to human beings, other living creatures, plants, property or the environment in general. Air pollution is probably one of the most serious environmental problems confronting our civilization today. Most often, it is caused by human activitiessuch as mining, construction, transportation, industrial work, agriculture, smelting, etc. However, natural processes such as volcanic eruptions and wildfires may also pollute the air, but their occurrence is rare and they usually have a local effect, unlike human activities that are ubiquitous causes of air pollution and contribute to the global pollution of the air every single day.

INTRODUCTION

Air pollution emanates from many sources, stationary sources such as factories, power plants, smelters and smaller sources such as dry cleaners and degreasing operations, mobile sources such as cars, buses, planes, trucks, and trains; anthropogenic activities and naturally occurring sources such as windblown dust and volcanic eruptions. In an even broader sense, air pollution means the presence of chemicals or compounds in the air which are usually not present and which lower the quality of the air or cause detrimental changes to the quality of life (such as the damaging of the ozone layer or causing global warming).

In Tamil Nadu air pollution is widespread in urban areas where vehicles are the major contributors and in a few other areas with a high concentration of industries and thermal power plants. Vehicular emissions are of particular concern since these are ground level sources and thus have the maximum impact on the general population.

RESEARCH METHODOLOGY

Being an explanatory research, researcher adopted secondary data for this study. The secondary data are from reviews journals, books and periodicals for the purpose of the study. Therefore whatever information is revealed by the present study is secondary data.

OBJECTIVES OF THE STUDY

1.To understand the concept of Air pollution.
2.To study about the impact of air pollution.
3.To know the problems facing by the people in Tamil Nadu.

HEALTH PROBLEMS

Air pollution can harm us when it accumulates in the air in high enough concentrations. Millions of Americans live in areas where urban smog, particle pollution, and toxic pollutants pose serious health concerns. People exposed to high enough levels of certain air pollutants may experience:

1.Irritation of the eyes, nose, and throat.
2.Wheezing, coughing, chest tightness and breathing difficulties.
3.Worsening of existing lung and heart problems, such as asthma.
4.Increased risk of heart attack.

ENVIRONMENTAL EFFECTS

Along with harming human health, air pollution can cause a variety of environmental effects: Acid rain is precipitation containing harmful amounts of nitric and sulfuric acids. These acids are formed primarily by nitrogen oxides and sulfur oxides released into the atmosphere when fossil fuels are burned. These acids fall to the Earth either as wet precipitation (rain, snow, or fog) or dry precipitation (gas and particulates). Some are carried by the wind, sometimes hundreds of miles. In the environment, acid rain damages trees and causes soils and water bodies to acidify, making the water unsuitable for some fish and other wildlife.

As of now in Chennai, the pollution control board operates eight manual ambient air quality monitoring stations, National Environmental Engineering Research Institute (NEERI) has three and Central Pollution Board has three CAMS in IIT, Alandur and Manali. In addition, there are 24 CAMS set-up by industries in Manali and Gummidipoodi areas whose data will be sent to TNPCB, said another TNPCB official.

The number of vehicles in Coimbatore has doubled from 4, 37,088 lakhs in 2000 (research data from Salim Ali Centre for Ornithology and Natural History) to over nine lakhs in early 2006. According to Central Pollution Control Board data there has been a steady increase in the levels of pollutants such as sulphur dioxide,

nitrogen dioxide as well as Suspended Particulate Matter that will affect the air quality. Though all vehicles are supposed to obtain the emission check certificate called Pollution under Control (which has to be renewed every six months), the methods adopted are not stringent enough to ensure total compliance.

IMPACT OF AIR POLLUTION IN INDUSTRIAL SECTOR

A national survey of the industrial sector states that the total estimated emissions of SPM from the 7 critical industries (Iron and steel, Cement, Sugar, Fertilizers, Paper and paper board, Copper and Aluminum) increased from 2 lakh tonnes in 1947 to 30 lakh tonnes in 1997. Of these seven critical industries, Tamil Nadu has a significant presence in cement, sugar and fertilizer industries. Many studies have revealed that pollution is concentrated in a few industrial sub-sectors and that a sector's contribution to pollution is often disproportionate to its contribution to the industrial output. For example, petroleum refineries, textiles, pulp and paper, and industrial chemicals produce 27 per cent of the industrial output but contribute 87 per cent of sulphur emissions and 70 per cent of nitrogen emissions. Likewise, iron and steel, and nonmetallic mineral products, produce about 16 per cent of the industrial output but account for 55 per cent of the particulate emissions.

VEHICULAR EMISSIONS

The density of motor vehicles per sq.km has increased from 22 in 1996 to 52 in 2004. This has led to traffic congestion and release of many toxic air pollutants into the atmosphere. Particularly, the growth of two wheelers is increasing in a steep manner, contributing to about 50.6 per cent of the pollution load. Poor maintenance of vehicles results in the spewing out of noxious fumes into the atmosphere. Roughly 400 tonnes of smoke units are being discharged into the atmosphere every day by the vehicles in Chennai. Adulterated fuel adds another dimension to the problem of pollution.

AIR POLLUTION CONTROL

The Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987 aims to prevent and control air pollution and preserve the air quality. As per the provisions of the Act, the State of Tamil Nadu is declared as an `Air Pollution Control Area'. The Board monitors industrial emissions through regular inspections of the air pollution control measures provided by the industries. Ambient air quality survey / stack emission survey are conducted to assess the quality of the emissions let out. In 2003-04, Ambient Air Quality surveys are conducted in 687 industries.

ALTERNATE FUEL

For controlling vehicular emission, cleaner fuel like unleaded petrol, petrol with 3 per cent benzene and low sulphur fuel (0.05 per cent) have been introduced in Chennai Metropolitan Area. Passenger cars complying with Bharat stage-II norms alone are registered in Chennai since July 2001. 2T oil auto dispensing system has been provided in retail outlets. The Board is also participating in a research project with a Non-Governmental Organization and the Civil Supplies Department to study the use of gas chromatograph to detect fuel adulteration.

CONCLUSION

Urban air pollution has long been a serious problem in the FSU, reflecting both the importance of highly polluting, resource-intensive industries for the national economy and political factors such as the low priority of environmental issues and lack of public participation. At the beginning of the transition from a centrally planned to a free market economy and a more open society, it was assumed that environmental performance in the FSU would improve. In particular, a shift away from heavy industries to less resource-intensive sectors and improvements in energy efficiency were expected to reduce air pollution levels. All countries of the FSU experienced a decline in industrial output following the change in economic regime and emissions of main pollutants have fallen as a result of a slump in production.

Many commentators saw this as a much needed break for the environment. However, while absolute levels of emissions have decreased, the ongoing economic crisis and persisting financial problems have ensured that decreases in emissions have been smaller than declines in output as a result of the associated deterioration of regulatory mechanisms, a lack of investment into pollution abatement equipment, weak enforcement of environmental legislation and public disengagement. In the areas benefiting from economic changes, and especially in large cities, environmental pressures have increased because of growing car ownership.

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24. RAINFALL AND ITS IMPACT ON MAIZE YIELD

A.S. KALAIVANI, Ph.D. Research Scholar (Full Time), Dept. of Business Admn., Annamalai University, Annamalai Nagar.

Dr. M. RAMESH, Professor, Dept. of Business Administration. Annamalai University, Annamalai Nagar.

ABSTRACT

The present study is to analyze the impact of rainfall on maize yield in Cuddalore district based on ten years data (2005-2006 to 2014-2015). The study conducted with the objective of relationship between area, production, actual rainfall, and maize yield in the study area. The results of the study reveal that actual rainfall adversely affects maize productivity, while the effect of actual rainfall is maximum negative and no significant for maize crops.

KEYWORDS: Maize area, production, rainfall.

INTRODUCTION

Climate is the main factor that influences any agricultural operation starting from field preparation to harvesting. Agriculture which relays on the climatic condition contributes to 10 per cent of Gross Domestic Product and provides employment for about 60 percent of the rural work force in Tamil Nadu. Temperature, humidity, rainfall, wind, atmospheric pressure, precipitation and other metrological condition decides the climatic condition of a particular place. Since the past few years the cropping pattern is experiencing a change due to the weather prevailing in the area. The effects of climate change have been found to have implications for dry land and irrigated crop yields as well as irrigation water use (Rosenzweig & Iglesias, 1994). Except rainfall, all other climatic factors are uniform and have little influence on crop yield. The drastic changes in the rainfall pattern of Tamil Nadu affect the significant area under cultivation.

Tamil Nadu is the eleventh largest and the seventh most populous state (6%) in the country. The cultivated area of the state is 4.7 million ha, comprising 36% of the total geographical area. The irrigated area covering 2.15 million ha is 46% of the cultivated area. The cropping intensity is around 113%. The red and black soils are deficient in nitrogen, phosphorus and zinc. The major crops are rice, jowar, bajra, maize, cotton, groundnut, mungbean, urdbean, banana and sugarcane. A clear knowledge on rainfall of a particular area, it would be possible to plan the production strategies suitable to that area in a better way. The major amount of rainfall is obtained through northeast monsoon followed by southwest monsoon. The table below shows the rainfall, production and productivity of major categories of food crops for the past four years.

The 20th century bears testimony to the indubitable fact of climate change as evidenced by increases in global temperatures and changes in rainfall patterns and rates (IPCC, 2001; Jung et al., 2002). In India, mean temperature, based on data from 73 meteorological stations, has shown a significant increase in warming amounting to 0.4°C over the last 100-year period (Hingane et al., 1985). IPCC has projected that by the end of the 21st century, rainfall over India will increase by 10-12 percent with more frequent and heavy rainfall days while the mean annual temperature will rise by 3-6°C (IPCC, 2014). These changes may culminate in adverse impacts on agriculture in terms of productivity loss, pest and disease increases and labor migration that will threaten food security and agricultural employment. The impact of climate change on agriculture is generally estimated using two broad approaches – agronomic (or crop simulation) and economic modeling, particularly Ricardian approaches (World Bank Report, 2010).

Agronomic methods are based on controlled experiments where crops are grown in field or laboratory settings, simulating different climate and CO2 effects (Aggarwal & Mall, 2002, Saseendran et al., 2000; Hebbar et al., 2008; Geethalakshmi et al., 2011). However, these models do not include farmers' adaptation to changing climate conditions and can overstate the damage caused by climate change (Mendelsohn & Dinar, 1999). The Ricardian models, on the other hand, use cross-sectional data to measure the impact of climate variables on land values or net revenues (Mendelsohn et al., 1994 & 1996; Mendelsohn and Dinar, 1999 & 2003; Kavikumar, 2009). Numerous studies using the Ricardian approach suggest that changes in temperature and rainfall in India could reduce average rice yield by 15 to 25 percent, average wheat yield by 30 to 35 percent (Kavikumar & Parikh, 1998) and farm net income by 8% (Mendelsohn et al., 1994). However, a shortcoming of this approach is the failure to account for time-independent location-specific factors such as the unobservable skills

of farmers and soil quality. In addition to these models, researchers have also used panel data to analyze the sensitivity of yield to weather variables (Chen et al. 2004; Isik & Devadoss, 2006; McCarl et al., 2008). Panel data models with fixed effects address the problems of estimation bias due to the omission of time-independent location-specific variables. Thus, in our study, we use a panel data approach to (i) to measure the impact of climate variables on the yield of major food crops; and (ii) to project the impact of climate change on yield sensitivities using the Regional Climate Model (RegCM4). Researchers often rely on Feasible Generalized Least Squares (FGLS) models for capturing the impact of climate variables, given heteroscedastic panel data (McCarl et al., 2008; Kim & Pang, 2009; Barnwal & Kotani, 2010).

This poses another estimation challenge because the FGLS formula for standard errors assumes that the error process is known and not estimated (Beck & Katz, 1995). But, in panel data models, the error process has a large number of unknown parameters, resulting in unreliable FGLS estimates of the standard errors of estimated coefficients. In this context, Beck and Katz (1995) propose using Panel Corrected Standard Errors (PCSE) models with Monte Carlo analysis. These models perform well and produce accurate estimates of sampling variability even in the presence of complicated panel error structures. Following Beck and Katz (1995), this study employs the PCSE model to measure the impact of climate change on the yield of major food crops in Tamil Nadu, India. An important feature of climate impact modeling is how future climate projections are made. Many impact studies either assume certain changes in climate variables from the baseline or use projections based on coarse resolution 2 South Asian Network for Development and Environmental Economics climate models such as Global Circulation Models (GCMs) (Chen et al., 2004). In this study, we use projections from a Regional Climate Model (RegCM4), which leads to better estimations of future climate conditions since its horizontal resolutions are finer than those of GCMs (IPCC, 2007).

REVIEW OF LITERATURE

Bhatta (2009) investigated the rainfall and temperature pattern for the past 50 years in India. In India, rising average wind speed is responsible for the increase in temperature. Due to high evaporation, rising sea surface temperature and air temperature, high intensity rain occurs. The occurrence of extreme rainfall is increasing and moderate rainfall is decreasing. But moderate rainfall is needed for crop growth. Extreme rainfall above 150 mm per day has increased by 10 per cent per decade for the past 50 years. Besides, after 1980, the temperature in the winter is more than that is in the summer. The maximum winter temperature is 1.25° Celsius, summer temperature is 0.7° Celsius and the minimum temperature is 0.7° Celsius in winter and 0.3° Celsius in summer across the country. Winter season temperature in North India is more than in South India. North India was affected by cold wave in 2002-03 but heat wave in 2003-04.

Swaminathan (2009) examined points out that, not only the rainfall, but also the distribution of rainfall is very important for the survival of crops, cattle and to maintain food security. Temperature variation, frequent droughts and floods are caused by climate changes. Climate is not consistent in India. Regions facing drought during the month of June and July face floods in August and September. Moreover most of the rainfall occurs within 100 hours of a year. This rainfall situation is not good for production and productivity of many crops and affects the poor's livelihood adversely.

Parsai (2009) investigated climate change and its threat to the world is real in the recent days. It is estimated that by 2025, in some parts of Asia and Africa and in India, the crop yields will decline by 20 to 40 per cent as a result of rise in temperature. Moreover climate change will make the land unfit for cultivation and many crops will be affected by pests and diseases. Ultimately, with water shortage and low food production, it is difficult to feed the world population.

Panda (2009) expressed that developing countries are more vulnerable to climate change than developed countries. Agriculture and allied activities are the most affected sector by climate change than other sectors. Indian agriculture basically depends upon temperature and rainfall, and variation in any one of these affects the production and productivity of crops. Ultimately it leads to decline in the GDP growth rate and creates adverse impact on the food security of rural poor and farmers. It is expected that, by 2100, the global mean temperature may increase between 1.4° Celsius and 5.8° Celsius and create much damages to the agricultural sector.

Mathi (2011) examined that globally the production of wheat and maize declined by 5.5 per cent and 3.8% respectively from 1980 to 2008. During this period, in Russia, wheat production declined by 15% due to unfavourable weather. As a result of the unfavorable weather the prices of crops like maize, wheat, rice and soyabean have gone up by 20%. If preventive measures are not taken, by the end of the 21th

century the temperature will reach 2° Celsius. The author forecasts that in Tamil Nadu there will be a 15 to 20 per cent decline in crop production

STUDY AREA

Cuddalore district consists of nine taluks viz. Cuddalore, Panruti, Kurinjipadi, Chidambaram, Kattumannarkoil, Virudhachalam, Bhuvanagiri, Veppur and Tittagudi of which Cuddalore, Kurinjipadi and Chidambaram are coastal taluks lying in the heavy wind and cyclone zone while other five taluks lye in the flood prone zone. Cuddalore is in the highly cyclone prone zone of the East coast and its neighborhood falls under rainfall surplus category with an annual precipitation of 1200 mm and the temperatures vary between 190 C to 260 C in winter and 310 C to 420 C in summer. The district gets rainfall mostly in the months of October to December from the Northeast monsoon recording which accounts for 72 per cent of the total rainfall. 60 per cent of land in Cuddalore district is used for crop cultivation with respect to agriculture crops like rice, maize, ragi. Black gram, green gram, horse gram, sugarcane, turmeric, groundnut, cotton. In Cuddalore district rice is majorly cultivated. So the present study considers the maize yield alone.

STATEMENT OF THE PROBLEM

This study is to determine the rainfall impact on maize yield and factors (area, production, rainfall and yield). In this study to find out the major problem and issue for maize yield affected by rainfall.

Objective of the study

To study the relationship between maize production, area, yield and actual rainfall.

Methodology

This study is descriptive in nature base on secondary data (2005-06 to2014-2015) and collected from agriculture, economics, statistics and meteorological department in Cuddalore district.

ANALYSIS

	Maize area	Maize yield	Maize production	Rainfall
Maize Area				
Maize yield	-.681*			
Maize production	.744*	-.250		
Rainfall	-.043	.434	-.084	

The above table reveals the correlation between maize yields with respected to area, production and annual rainfall in Cuddalore district during 2005-06 to 2014-15. Maize yield (r = -.681), are negatively correlated and there is no significant relationship with maize area. Maize production (r = .744) positively correlated and there is significant relationship with maize area. Annual rainfall (r = -.043) are negatively correlated and there is no significant relationship with maize area. Maize production (r = -.250) are negatively correlated and there is significant relationship with maize yield. Maize yield (r = .434) positively correlated and there is significant relationship with annual rainfall. Annual rainfall (r = -.084) are negatively correlated and there is no significant relationship with maize production. Due to instable rainfall in Cuddalore district during the year 2005-2015 the yield is negatively correlated. Climate change is mostly affected to the crop yield.

CONCLUSION

Cuddalore district has faced extreme weather events like untimely and heavy rainfall and flash floods in affecting huge damage to the major crops and properties of farmers. It is expected that the above-mentioned situation will increase as a function of climate change. Rainfall decides the food grains production and productivity in the significant area in both rain fed and irrigation agriculture. It is identified that the monsoon rainfall are very useful to agriculture production. Predicting the monsoon and deciding the crops as per the monsoon will increase the production of food grains. The catchment reservoirs could be cleaned before the raining season to increase the water holding capacity of the dams which serves as a major irrigation source for the agricultural lands. The government should take the action of national level river linking system/Project soon to save or preserve the agricultural land.

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25. A COMPARATIVE ANALYSIS OF SOLID WASTE MANAGEMENT IN RURAL AND URBAN AREAS OF TAMIL NADU

Dr.R.KARTHIKEYAN, Associate Professor of Economics, AVC College (Autonomous), Mayiladuthurai, 609 305 E mail: drrkavc@gmail.com.

Dr.S.USHA RANI, Asst. Professor of Economics, ADM College for Women (Autonomous), Nagappattinam. 611001.

ABSTRACT

The major environmental problems that pose serious threat today include solid waste disposal, waste water management, corrosion, fouling, deforestation, pollution etc, These problems deny a clean and healthy environment for living, Rapid industrialization, population growth and urbanization, sophistication in life style and unlimited use of synthetic chemicals are of specific concerns among others in one side and changes in economic structure in rural areas on the other in contributing to overall environmental problems. These wastes have been proved to be extremely toxic and infectious the uncontrolled and unscientific dumping of such wastes has brought about a rising number of incidents of hazardous to human health. More serious risk to human health is envisaged due to contamination of surface and ground water. The management of urban and rural solid waste suffers from many problems and constraints, which inhibit the proper and effective disposal of solid waste, these problems and constraints result in operational and maintenance functioning and in inadequate salvaging of resources present in the wastes, These problems need to be highlighted, discussed and overcome through political will, administrative determination, technical skills, reorientation of efforts and overcoming of barriers in decision making at all levels. Thus, there is a need to understand the implementation issues related to solid waste management with a view to provide Eco- friendly, Sustainable and community-based solutions to waste management problems. Based on the above, the present paper entitled "A Comparative Analysis of solid Waste Management in Rural and Urban Areas of Tamil Nadu" makes an attempt to study the aspects of solid waste management in rural and urban areas of Nagapattinam district. However, the specific objectives are to analyse the region wise sources and quantum of solid wastes in the study area; to study the causes for solid wastes generation and disposal in the study area; to probe in to the methods of disposal of solid wastes in the study area and to find the difference if any, in the method of disposal between rural and urban areas; and to explore the problems in the Solid Waste Management among the respondents in the study area; and to suggest possible measures to formulate strategies for effective solid waste management in the study area. This paper suggests that proper measures to be taken to create public awareness and to bring about changes in public behaviour through development of public awareness programs, such as Promotion of "Reduce, Re-use and Re-cycle (R-R-R)" of Waste principle; Promotion of Public Participation in SWM Systems; Provision of Information Hot-line; Inculcation of Public Education through Group Education by Group Meetings in the community, Workshops, Exhibitions, Lecture series, Panel Discussions, etc.; Promotion of Mass Education through the Use of Print and Electronic Media, Use of School Children, Provision of Primary School Curriculum to cover the subject, Involvement of National Cadet Corps (NCC), National Social Service, Involvement of Religious Leaders, Involvement of Medical Practitioners, Involvement of SHGs, Resident Associations and Voluntary Organizations/NGO involvement

RATIONALE

The solid wastes have become significant political, social and environmental issues; setting new disposal facilities to manage these wastes have become difficult as the population to grow rapidly. Much of what has come to be considered the "Garbage crisis" in the world is not the product of immediate past practices or present inaction, but a series of chronic problems interrelated in such a way as to defy a clear solution. Rapid industrialization, population growth and urbanization, sophistication in life style and unlimited use of synthetic chemicals are of specific concerns among others in one side and changes in economic structure on the other in contributing to overall environmental problems. The waste management in India is the responsibility of local governments, though it has been intended that local government

would raise the financial resources required for the provision of basic civil amenities, including waste management, As a result, local authorities are not strongly placed to have a comprehensive set of waste management policies of their own. Instead; they act only as implementing agencies for scheme formulated at the national level. Urbanization and industrialization in general terms, the urban population produced two to three times more of the municipal solid waste than the semi-urban and rural population per capita per year. The management of urban and rural solid waste suffers from many problems and constraints, which inhibit the proper and effective disposal of solid waste, these problems and constraints result in operational and maintenance functioning and in inadequate salvaging of resources present in the wastes, These problems need to be highlighted, discussed and overcome through political will, administrative determination, technical skills, reorientation of efforts and overcoming of barriers in decision making at all levels. Some of these problems such as in sufficient funds available with local bodies, lack of established and efficient system of collection, transportation, disposal of wastes, lack of trained and knowledgeable manpower in local bodies, inadequate employees performance monitoring, motivation, discipline to mention a few.

Across the country, many organization and individuals have found innovative ways to reduce and manage the solid wastes through a coordinated mix of practices. Thus, there is a need to understand the implementation issues related to solid waste management with a view to provide Eco- friendly, Sustainable and community-based solutions to waste management problems. Based on the above, the present paper entitled "A Comparative Analysis of solid Waste Management in Rural and Urban Areas of Tamil Nadu" makes an attempt to study the aspects of solid waste management in rural and urban areas of Nagapattinam District, Tamil Nadu.

OBJECTIVES AND HYPOTHESES

However, the specific objectives are to analyse the region wise sources and quantum of solid wastes in the study area; to study the causes for solid wastes generation and disposal in the study area; to probe in to the methods of disposal of solid wastes in the study area and to find the difference if any, in the method of disposal between rural and urban areas; and to explore the problems in the Solid Waste Management among the respondents in the study area; and to suggest possible measures to formulate strategies for effective solid waste management in the study area.

Based on these objectives the following hypotheses have been formulated. It is assumed that there are host of factors influencing the household solid wastes management, such as, religion, educational status, family size, income, consumption pattern, occupation etc. among these factors, the economic factors are influencing more than that of others.

There is a significant difference registered in the quantity of wastes disposal and method of solid wastes management followed between the urban and rural area

There is a significant difference registered in the incidence of problems in the disposal of solid wastes between rural and urban areas. However, the urban respondents are suffering more than that of rural respondents

MATERIALS AND METHODS

Nagappattinam district has been purposively chosen as the study area since it is one of the environmental disaster prone and recently trifurcated districts of Tamil Nadu. Then to represent urban area, one taluk from the district, Mayiladuthurai was chosen, followed by Five representative wards of the Municipality and to represent the rural area, Five representative revenue villages of the taluk have been chosen. A total of 208 respondents consisting 94 respondents from urban area and 114 respondents from rural area were selected at randomly.

The present study has been based on Primary data; Survey Method has been adopted for the data collection. The data relating to demographic characteristics, socio-economic profiles of the households, information on waste generation, components of solid wastes, waste disposal practices, problems faced by the respondents in the wastes disposal and management, etc. have been gathered through a well structured interview schedule.

MAJOR FINDINGS

The solid waste generation and disposal is closely associated with the social variables the basic social profile such as the sex, religion, community, age, family type and family size is taken for analysis and it is found from the analysis that around 85 % are male and only 15 % are female, more than 70 % are the Hindu and negligible per cent of Muslim and Christian are found in both the rural and urban areas of the study. Further the community distribution registers more than 40% belong to BC, about 20 % belong to SC/STs and MBCs and only less than 8 % are OC respondents in the study area. It is also observed that still the joint family system prevails in the region i.e. 16% of the respondents in the urban area and 20 % of the rural

respondents reside with joint family system. There is no vast difference in the medium family size distribution i.e. 27 % of the respondents but 19% of the respondents' households belong to the large family size group.

As the aspects of solid waste management is closely related to the economic status of the respondents the major economic variables such as income, expenditure, savings position, Asset Position, indebtedness of the respondents have been taken for analysis and it is found that with regard to income distribution only 2 % of the urban respondents and 9 % of the rural respondents have earned less than Rs.5000/- monthly and it is 38 % of the urban respondents and 23 % of the rural respondents have earned more than Rs. 15000/- per month. Majority of the respondents about 60 % have earned up to 15000/- per month in both the regions. However, comparatively the income of urban respondents is higher than that of the rural respondents in the study area. The same trend is attributed in the case of expenditure and savings also. Since the income has its influence on the level of consumption and savings 12 % of the urban respondents and 27 % of the rural respondents have spent less than Rs.4000/- per month and 38 % of the urban respondents and 19 % of the rural respondents have spent more than Rs.12000/- per month on consumption.; while 7.5 % of the urban respondents and 25 % of the rural respondents have not saved any amount so far in one side and it is appreciable to note that about 10 % of the urban respondents and 2 % of the rural respondents have saved more than Rs.40000- on the other. Similarly, the indebtedness is also more among urban respondents than that of rural respondents. since about 10 % of the urban respondents have indebted more than Rs.5 Lakhs while only less than 1 % of the rural respondents have highly indebted in the study area. Further it is observed that there are variations in the economic status between the urban and rural respondents in the study area.

Since the environmental awareness is closely associated to level of education the educational status of the respondents has been compared. It is found that still 2 % of the urban respondents and 6 % of the rural respondents are illiterates in one side and 7 % of the urban respondents and 3 % of the rural respondents are higher educated on the other. Further it is known that more than 50 % of the rural respondents are primary educated and about 50 % of the urban respondents are higher secondary educated. From the analysis, both the rural urban areas the literacy level exceeds the state average.

The income wise quantity of solid waste generation in the study area shows that there is a direct association between the income and quantity of solid waste generated both the rural and urban areas. However, the respondents whose income is up to Rs.5000 generate 520 Gms of solid waste per day while it is 810 Gms for the respondents whose monthly income is above Rs.20000 in urban areas whereas it was 480 Gms and 600gms respectively in the rural areas. The average difference between urban and rural regions ranges between 40 Gms and 110 Gms.

There is a significant difference registered between the rural and urban respondents in the case of waste generation with regard to educational status since the difference in the absolute quantity of waste ranges between 50 Gms and 180 Gms. From the hypotheses testing, it can be inferred that the quantity of waste is dependent on education (Chi square value 43.74); on Community Status (Chi- value 89.83)of the sample respondents.

The average quantity of waste is increased with the level of consumption in both regions. But there is a significant difference registered between the rural and urban respondents in the case of waste generation with regard to monthly consumption expenditure since the difference in the absolute quantity of waste ranges between 40 Gms and 165 Gms.

The average quantity of waste is increased with the value of asset position in both regions. But there is a significant difference registered between the rural and urban respondents in the case of waste generation with regard to asset position since the difference in the absolute quantity of waste ranges between 40 Gms and 135 Gms respectively. Further there is a significant difference registered between the rural and urban respondents in the case of waste generation with regard to occupation since the difference in the absolute quantity of waste ranges between 20 Gms and 240 Gms.; Further, it is found that the quantity of waste is dependent on the occupation (Chi- Square value is 67.56) of the sample respondents.

It is also found that the average quantity of waste is increased with the family size in both regions and there is a significant difference registered between the rural and urban respondents in the case of waste generation with regard to family size since the difference in the absolute quantity of waste ranges between 55 Gms and 165 gm.

To measure the factors influencing the quantity of household solid waste generation the regression model has also been applied. It is calculated that the value of R2 is 0.79 which implies that 79 % of variation in the quantity

of generation of solid wastes is influenced by these variables which are included in the model. From this model, it is found that among these variables, the Consumption Expenditure is primarily influencing the quantity of waste generation since the calculated regression coefficient for consumption expenditure is 0.26 followed by income (0.21), Family Size (0.19), Asset Position (0.14), Level of Education (-0.16) and Occupation (0.17). from this model it could be inferred that the economic variables such as consumption expenditure, income, asset position come together having 61 5 of influence on the waste generation the hypothesis that hypothesis that there are host of factors influencing the household solid wastes management, such as, religion, educational status, family size, income, consumption pattern, occupation etc. among these factors, the economic factors are influencing more than that of others is proved.

Further based on the't 'value given in the analysis, it could be obvious to infer that there is a significant difference registered in the quantity of waste generation at 1 % level between urban and rural areas and hence the hypothesis that there is a significant difference registered in the quantity of wastes generation between the urban and rural area is also proved.

In the present study area, among the urban respondents majority (56.5 %) have thrown the wastes into their Backyard followed by thrown in to Common garbage Bin (15. 9 .%) and it is appreciable to note that only 12 respondents have burnt the wastes. Where as in the rural areas, more than 75 % of the respondents have thrown the wastes into their Backyard and it is to be noted hat the plastic wastes have not been properly managed as they disposed off either in open place, or other unsafe modes.

It is pathetic to find that the other than plastic, glass, tin, kitchen wastes, paper, polythene wastes are also been not effectively managed in the study area as about 5.5 % of the urban respondents and 11.4 % of the rural respondents have burnt the wastes.

With regard to storing of solid waste, In the study area, about 45 % of the urban respondents have kept their wastes inside of their home and only 25 % of the rural respondents have kept their wastes inside of their home. This difference may be mainly due to availability of out side place which is normally short in urban areas than rural areas. it is known that out of total sample respondents 66 % have kept the wastes outside.

The source wise dumping of the wastes in the be noted that in the urban area, the concrete bin was primarily used (32%) followed by plastic basket (28%), plastic container (23%) , plastic bag (14%) and slurry pits (3%) where as in the rural area, the slurry pits stands first i.e.52% respondents have dumped their wastes into slurry pits followed by plastic basket (23%), plastic bag (11%), plastic container (8%) and only 6% have dumped into concrete bin. From this it is clear that in the urban area the concrete bin is used as the prime source and in the rural area the slurry pit is used as the prime source of container of dumping of solid wastes. It is also observed that the rural people save their domestic wastes for some times and some extent of urban people are having habit of disposal of wastes immediately it was generated.

In the study area this it is found that in the rural area the Lorry is used as the prime vehicle and in the urban area the Tricycle is used as the prime vehicle for waste collection. Further, the collection of solid waste is done by three different modes viz, directly by Municipal Corporation,/ Panchayats or through contract or through community organizations.

The gender wise incidence of problems in the solid waste management i.e. collection, storage and disposal of solid wastes reveal that among the urban respondents 26% (85% are male and 15% are female) are facing problems in collection, 46% (82 % are male and 18 % are female) are facing the problems relating to storage and 28% (74 % are male and 26% are female) are facing problems relating to disposal of solid waste. Whereas in the rural area,28% (39% are male and 61% are female) are facing problems in collection, 39% (57 % are male and 43 % are female) are facing the problems relating to storage and (54 % are male and 46% are female) 33% are facing problems relating to disposal of solid waste. It is found that the male are comparatively realizing more problems than that of female. Further it is known that among these three major problems, the problems in the storage stands first followed by disposal and collection. It could also be observed that in both the areas, as the level of education improves the incidence of problems in the solid waste (collection, Storage and disposal) declines. It is found that there is a significant difference registered in the incidence of problems in the disposal of solid wastes between rural and urban areas. However, the urban respondents are suffering more than that of rural respondents.

SUGGESTIONS

It is observed from the analysis that in the study municipality, the solid-waste collection in residential and commercial sites has been done by street-sweeping services and waste collection from households and commercial

areas.

It is suggested that the effective solid waste management system viz, resource recovery through sorting and recycling i.e., recovery of materials such as paper, glass, metals or recovery of energy through biological, thermal or other processes. Waste transformation leads to reduction in volume and toxicity, which helps in safe and sustainable disposal in landfills should be followed.

Measures may be taken to create awareness on the incidence of the problems of waste accumulation and the way it affects their lives directly.

The practice of minimisation of generation of solid wastes should be encouraged through inculcation of educating people about it like using less of plastics or reduce waste disposal by recovering maximum possible recyclable materials from it.

It is also suggested that the municipal solid waste should be segregated into organic, inorganic, recyclable and hazardous waste, which has not been observed in the study area.

For effective solid waste management possible alternatives such as Composting – from organic portion of waste and Incineration- for non-recyclable portion of waste can be considered for working out the economic value for the solid waste disposal besides land filling of solid waste for the study area.

It is suggested that the Local bodies may introduce fiscal control measure such as penalty of administrative charges or special cleaning charges for those who litter the streets or cause nuisance on the streets to punish them.

It is suggested that Green Productivity and Other Waste Minimization Approaches may be adopted by the study area like already it has been practiced the Metropolitan city Delhi.

Proper measures may be taken to promote public participation in waste management efforts through private partnership where feasible.

Above all, proper measures to be taken to create public awareness and to bring about changes in public behaviour through development of public awareness programs, such as Promotion of "Reduce, Re-use and Re-cycle (R-R-R)" of Waste principle; Promotion of Public Participation in SWM Systems; Provision of Information Hot-line; Inculcation of Public Education through Group Education by Group Meetings in the community, Workshops, Exhibitions, Lecture series, Panel Discussions, etc.; Promotion of Mass Education through the Use of Print Media, Use of TV / Cable TV / Radio/Web Site, Use of Cinema Halls, Street Plays, Puppet Shows, etc., Posters, Pamphlets, Use of Public Transport System, Use of School Children, Provision of Primary School Curriculum to cover the subject, Involvement of National Cadet Corps (NCC), National Social Service, Involvement of Religious Leaders, Involvement of Medical Practitioners, Involvement of SHGs, Resident Associations and Voluntary Organizations/NGO involvement

There is need to bring all stakeholders i.e., municipal authority, development authority, community, NGO's and waste collectors together to manage solid waste in the study area environmentally and economically viable manner. This requires to create awareness about the environmental aspects and to develop sustainable solid waste management public practices to all stakeholders. It is appreciable to suggest that in the study area recently Tamil Nadu Central University (Tiruvarur) was established with special attention. More Research and Development activities may be undertaken by the university authorities for the effective Solid Waste Management through its Department of Environment in this district on model basis which can be disseminated in all other areas in future.

CONCLUSION

The solid wastes have become significant political, social and environmental issues; setting new disposal facilities to manage these wastes have become difficult as the population to grow rapidly. Much of what has come to be considered the "Garbage crisis" in the world is not the product of immediate past practices or present inaction, but a series of chronic problems interrelated in such a way as to defy a clear solution. What once was considered simply a nuisance or even more seriously a health hazard in the past has become a major environmental plight in the 20th centuries the problem of environmental pollution in India crises more from the rivers which have been heavily polluted by the discharged of effluents from factories and the dumping of sewage. It is fond hope that through wide propagation of the message that the "Clean City Program" and "Clean Village Program" through government initiatives and public participation, the problem of solid waste management can be solved to the desirable extent both in rural as well as in urban areas.

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26. A STUDY ON THE AWARENESS OF THE STUDENTS TOWARDS HEALTH HAZARDS AND ITS IMPACT WITH SPECIAL REFERENCE TO CHENNAI CITY

Dr. LEELA BHASKAR, (Retd) Associate Professor, Department of Economics, Ethiraj College For Women, Chennai-600008 Email-leelabhaskar3@gmail.com, Ph:00-91-9962089727.

Mrs. R. SANGEETHA, Part time PhD Scholar, Department of Economics, Kumararani Meena Muthiah College of Arts & Science (Co-Ed),Adyar, Chennai-600008 Email-sangsanandan@gmail.com, Ph: 9840130432.

INTRODUCTION

The environment is a place to live our life happily. A happy life is a contented life with no problems. But the environment needs to be protected from various problems which ultimately affect the health of human beings. The environment is now being affected by various factors and is becoming a great threat all over the world. The environment is affect by air, water and sound in the form of air pollution, water pollution and noise pollution. It is not only pollution that is affecting the environment but even the usage of tobacco for example , can have a harmful effect on human lives. The study is intended to find out the awareness of the student community towards the health hazards and their impact.

OBJECTIVES OF THE STUDY

1.To find out the awareness of the students regarding the health hazards and its impact on health
2.To bring out the remedial measures
3.To obtain suggestions for the same

RESEARCH METHODOLOGY

Aim: To find out the awareness of the students regarding the health hazards and its impact on health

PRIMARY DATA: Information to be obtained through a survey with the use of a questionnaire
SECONDARY DATA: books, references, journals, web sources
Sample size: 30
Sampling technique: convenience sampling
Tools used: percentage analysis

REVIEW OF LITERATURE

Remoundou K et.al points out that the major reason for the cause of premature deaths is because of air pollution. He also says that diseases caused by air pollution like respiratory infections, heart diseases and lung cancer can be controlled by proper measures taken to control it.

Thompson RC et.al points out the harmful effects of chemicals use in the manufacture of plastics and how these cause health problems to human beings.

Rabeya Begum Raba et.al brings out the problems arising due to the water salainity that leads to unsafe drinking water in the areas of Bangladesh.

Roya Kelishadi brings out the various causes for the environmental pollution due to gas emissions and acid deposits and changes in lifestyle patterns and measures to control them. Pollution is one important factor that needs to be controlled to protect the environment and the health of mankind. There are different types of pollution namely air pollution, water pollution, noise pollution. Apart from the normal causes of pollution, we should know that pollution can also be caused by biomass such as firewood, crop residue and even cow dung cake that is used as a main source of fuel. This happens in places where these materials are used as fuel. According to the Census 2011, more than 60 per cent of people in India use biomass such as firewood, crop residue and cow dung cake as the main source of fuel. In rural areas more than 85 per cent of households use biomass as cooking fuel by directly burning them. Health hazards can be due to a number of factors like the use of tobacco, mobile phones, plastic covers, ultra violet radiation, improper garbage disposal, climatic changes, and many more.

The study was conducted to find out the awareness of the students towards the various health problems caused by the hazards in the environment. Health is one main factor that contributes to the development of the society and the nation. Human resource is one that cannot be replaced by any other resource. The healthy society will lead to advancement needed for the society.

CAUSES FOR POLLUTION CAN ALSO BE DUE TO THE FOLLOWING FACTORS:

→ Tobacco smoke
→ Asbestos
→ Paints
→ Traditional fuel
→ Solid fuels
→ Biomass fuels, and many more.

The researcher mentions few laws to protect

the environment that can be cited below:
General
1986 - The Environment (Protection) Act authorizes the central government to protect and improve environmental quality, control and reduce pollution from all sources, and prohibit or restrict the setting and /or operation of any industrial facility on environmental grounds.
1986 - The Environment (Protection) Rules lay down procedures for setting standards of emission or discharge of environmental pollutants.
1989 - The objective of Hazardous Waste (Management and Handling) Rules is to control the generation, collection, treatment, import, storage, and handling of hazardous waste.
1989 - The Manufacture, Storage, and Import of Hazardous Rules define the terms used in this context, and sets up an authority to inspect, once a year, the industrial activity connected with hazardous chemicals and isolated storage facilities.
1989 - The Manufacture, Use, Import, Export, and Storage of hazardous Micro-organisms/ Genetically Engineered Organisms or Cells Rules were introduced with a view to protect the environment, nature, and health, in connection with the application of gene technology and microorganisms.
1991 - The Public Liability Insurance Act and Rules and Amendment, 1992 was drawn up to provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident while handling any hazardous substance.
1995 - The National Environmental Tribunal Act has been created to award compensation for damages to persons, property, and the environment arising from any activity involving hazardous substances.
1997 - The National Environment Appellate Authority Act has been created to hear appeals with respect to restrictions of areas in which classes of industries etc. are carried out or prescribed subject to certain safeguards under the EPA.
1998 - The Biomedical waste (Management and Handling) Rules is a legal binding on the health care institutions to streamline the process of proper handling of hospital waste such as segregation, disposal, collection, and treatment.
1999 - The Environment (Siting for Industrial Projects) Rules, 1999 lay down detailed provisions relating to areas to be avoided for siting of industries, precautionary measures to be taken for site selecting as also the aspects of environmental protection which should have been incorporated during the implementation of the industrial development projects.
2000 - The Municipal Solid Wastes (Management and Handling) Rules, 2000 apply to every municipal authority responsible for the collection, segregation, storage, transportation, processing, and disposal of municipal solid wastes.
2000 - The Ozone Depleting Substances (Regulation and Control) Rules have been laid down for the regulation of production and consumption of ozone depleting substances.
2001 - The Batteries (Management and Handling) Rules, 2001 rules shall apply to every manufacturer, importer, re-conditioner, assembler, dealer, auctioneer, consumer, and bulk consumer involved in the manufacture, processing, sale, purchase, and use of batteries or components so as to regulate and ensure the environmentally safe disposal of used batteries.
2002 - The Noise Pollution (Regulation and Control) (Amendment) Rules lay down such terms and conditions as are necessary to reduce noise pollution, permit use of loud speakers or public address systems during night hours (between 10:00 p.m. to 12:00 midnight) on or during any cultural or religious festive occasion
2002 - The Biological Diversity Act is an act to provide for the conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of the benefits arising out of the use of biological resources and knowledge associated with it
WATER
1882 - The Easement Act allows private rights to use a resource that is, groundwater, by viewing it as an attachment to the land. It also states that all surface water belongs to the state and is a state property.
1897 - The Indian Fisheries Act establishes two sets of penal offences whereby the government can sue any person who uses dynamite or other explosive substance in any way (whether coastal or inland) with intent to catch or destroy any fish or poisonous fish in order to kill.
1956 - The River Boards Act enables the states to enroll the central government in setting up an Advisory River Board to resolve issues in inter-state cooperation.
1970 - The Merchant Shipping Act aims to deal with waste arising from ships along the coastal areas within a specified radius.
1974 - The Water (Prevention and Control of Pollution) Act establishes an institutional structure for preventing and abating water pollution. It establishes standards for water quality and effluent. Polluting industries must seek permission to discharge waste into effluent bodies.

The CPCB (Central Pollution Control Board) was constituted under this act.

1977 - The Water (Prevention and Control of Pollution) Cess Act provides for the levy and collection of cess or fees on water consuming industries and local authorities.

1978 - The Water (Prevention and Control of Pollution) Cess Rules contains the standard definitions and indicate the kind of and location of meters that every consumer of water is required to affix.

1991 - The Coastal Regulation Zone Notification puts regulations on various activities, including construction, are regulated. It gives some protection to the backwaters and estuaries.

AIR

1981 - The Air (Prevention and Control of Pollution) Act provides for the control and abatement of air pollution. It entrusts the power of enforcing this act to the CPCB .

1982 - The Air (Prevention and Control of Pollution) Rules defines the procedures of the meetings of the Boards and the powers entrusted to them.

1982 - The Atomic Energy Act deals with the radioactive waste.

1987 - The Air (Prevention and Control of Pollution) Amendment Act empowers the central and state pollution control boards to meet with grave emergencies of air pollution.

1988 - The Motor Vehicles Act states that all hazardous waste is to be properly packaged, labelled, and transported.

The above laws have been sourced from:

Environmental policy-making in India – The process and its pressure, TERI report.

Indian Environmental Legislations, list from the MOEF web site.

Strengthening Environmental Legislations in India, document by Centre for Environmental Law, WWF.

SOME OF THE MEASURES THAT CAN BE ADOPTED TO CONTROL POLLUTION

→ Awareness on the harmful effects of biomass

→ Using biogas instead of biomass

→ Producing gobar gas using cowdung as an alternative instead of cowdung

→ Fuel efficient & smokeless cooking stoves

→ Cross ventilation, window above stoves

The above measures can be cited as examples to control pollution , as there are several measures to control the different types of pollution.

ANALYSIS AND INTEPRETATION OF THE STUDY

The study was intended to find out the awareness of the students with regard to the environmental health hazards and their impact on the health of human beings.

TABLE 1 SHOWING THE GENDER OF THE RESPONDENTS

	No. Of respondents	Percentage
MALE	20	67%
FEMALE	10	33%
Total	30	100%

DIAGRAM SHOWING THE GENDER OF THE RESPONDENTS

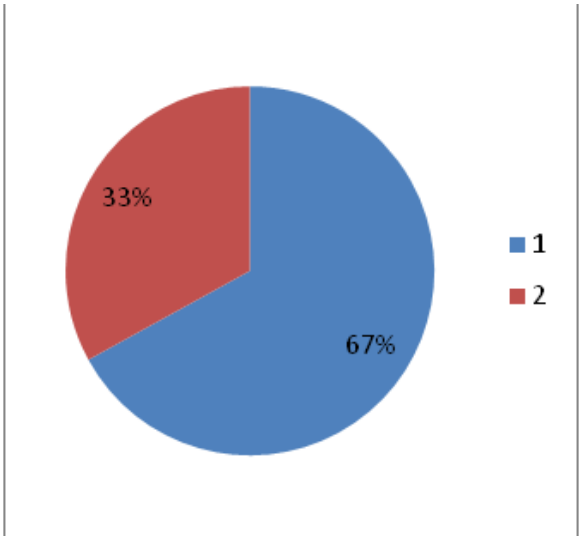


TABLE 2 SHOWING AWARENESS OF RESPONDENTS REGARDING HARMFUL EFFECTS OF ULTRAVIOLET RADIATION ON HEALTH

	No. Of respondents	Percentage
YES	23	77%
NO	7	23%
Total	30	100%

DIAGRAM 2 SHOWING THE AWARENESS OF THE RESPONDENTS REGARDING THE HARMFUL EFFECTS OF ULTRA VIOLET RADIATION ON HEALTH

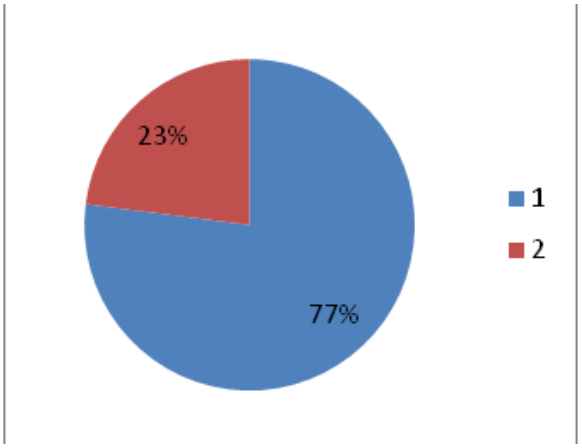


TABLE 3 SHOWING AWARENESS OF RESPONDENTS REGARDING THE RISK DUE TO SMOKING

	No. Of respondents	Percentage
YES	26	87%
NO	4	13%
Total	30	100%

DIAGRAM 3 SHOWING AWARENESS OF RESPONDENTS REGARDING THE RISK DUE TO SMOKING

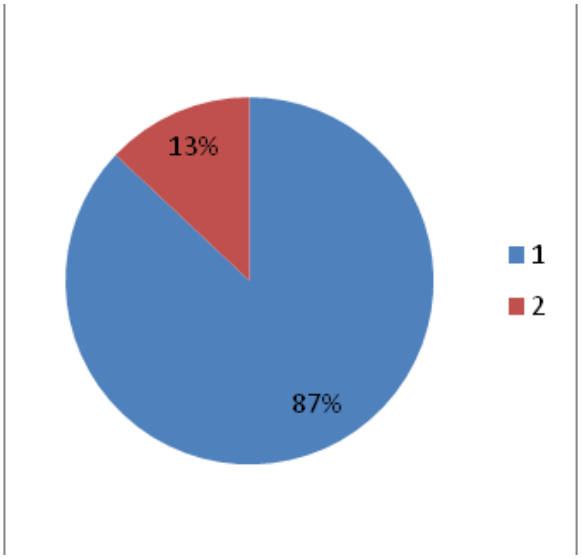


TABLE 4 SHOWING THE AWARENESS OF THE RESPONDENTS REGARDING HEALTH PROBLEMS DUE TO AIR POLLUTION

	No. of respondents	Percentage
YES	18	60%
NO	12	40%
Total	30	100%

DIAGRAM 4 SHOWING THE AWARENESS OF THE RESPONDENTS REGARDING HEALTH PROBLEMS DUE TO AIR POLLUTION

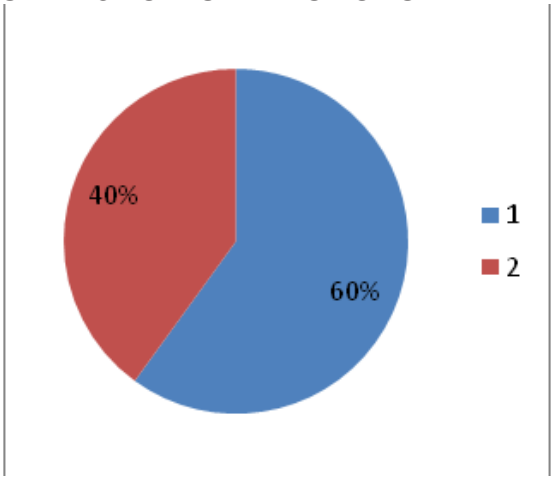


TABLE 5 SHOWING THE AWARENESS OF RESPONDENTS ABOUT THE RISK DUE TO THE USAGE OF MOBILE PHONES

	No. of Respondents	Percentage
YES	16	53%
NO	14	47%
TOTAL	30	100%

DIAGRAM 5 SHOWING THE AWARENESS OF RESPONDENTS ABOUT THE RISK DUE TO THE USAGE OF MOBILE PHONE

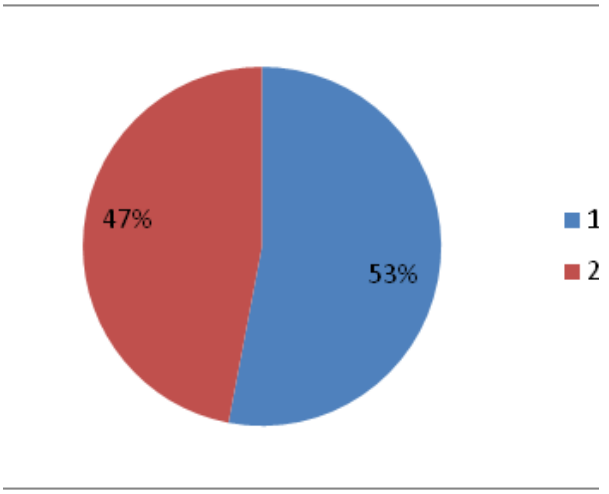


TABLE 6 SHOWING THE AWARENESS OF THE RESPONDENTS REGARDING THE HARMFUL EFFECTS OF NOISE POLLUTION

	No. of Respondents	Percentage
Yes	17	57%
No	13	43%
Total	30	100%

DIAGRAM 6 SHOWING THE AWARENESS OF THE RESPONDENTS REGARDING THE HARMFUL EFFECTS OF NOISE POLLUTION

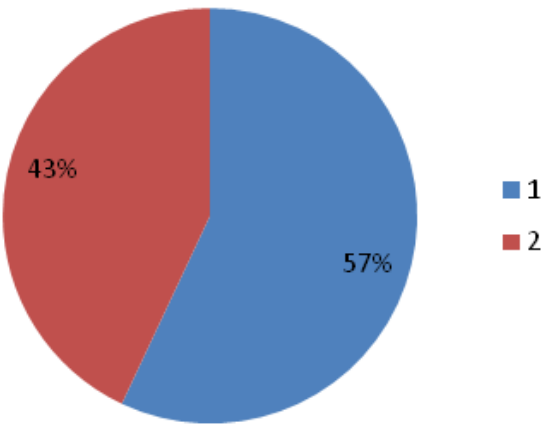


TABLE 7 SHOWING THE AWARENESS OF THE RESPONDENTS TO THE GLOBAL CLIMATIC CHANGE AND ITS IMPACT ON HEALTH

	No. of respondents	Percentage
YES	21	70%
NO	9	30%
Total	30	100%

DIAGRAM 7 SHOWING THE AWARENESS OF THE RESPONDENTS TO THE GLOBAL CLIMATIC CHANGE AND ITS IMPACT ON HEALTH

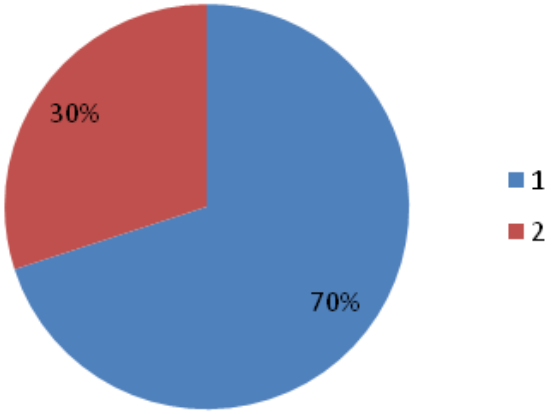


TABLE 8 SHOWING THE AWARENESS OF THE RESPONDENTS REGARDING THE USE OF PLASTICS AND THE RISK FACTORS ASSOCIATED WITH IT

	No. of respondents	Percentage
YES	24	80%
NO	6	20%
Total	30	100%

DIAGRAM 8 SHOWING THE AWARENESS OF THE RESPONDENTS REGARDING THE USE OF PLASTICS AND THE RISK FACTORS ASSOCIATED WITH IT

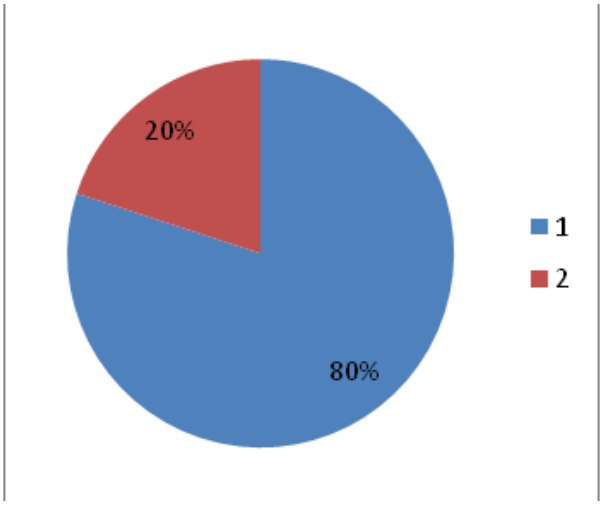


TABLE 9 SHOWING THE DISPOSAL OF GARBAGE IN A PROPER MANNER BY THE RESPONDENTS

	No. Of respondents	Percentage
YES	18	60%
NO	12	40%
Total	30	100%

DIAGRAM 9 SHOWING THE DISPOSAL OF GARBAGE IN A PROPER MANNER BY THE RESPONDENTS

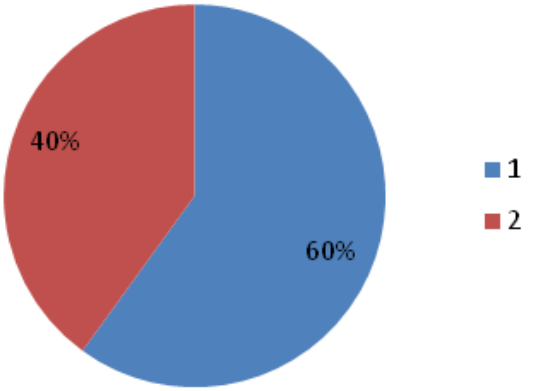
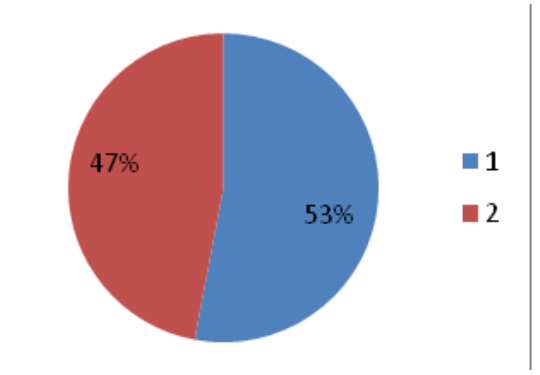


TABLE 10 SHOWING THE AWARENESS OF THE RESPONDENTS REGARDING THE VARIOUS LAWS RELATING TO PROTECTION OF THE ENVIRONMENT FROM VARIOUS HEALTH HAZARDS

	No. of Respondents	Percentage
YES	16	53%
NO	14	47%
TOTAL	30	100%

DIAGRAM 10 SHOWING THE AWARENESS OF THE RESPONDENTS REGARDING THE VARIOUS LAWS RELATING TO PROTECTION OF THE ENVIRONMENT FROM VARIOUS HEALTH HAZARDS



FINDINGS

→ Majority of the respondents were aware of the health problems caused by the pollution in the environment

→ Most of the respondents know that laws exist to protect the environment

→ The male respondents very well know about the adverse effect of the use of tobacco

→ More than half of the respondents know the harmful effects of the radiation caused by the cell phones as they are using the mobile phones for longer hours

→ Most of the respondents say that the effect of noise pollution is little when compared to the other types of pollution

→ The awareness regarding the harmful effects of climatic changes is lesser

→ Most of the respondents know the harmful effects of the plastic covers over the environment

→ With regard to garbage disposal, the respondents said that it is disposed properly in their homes as they segregate the wastes accordingly

SUGGESTIONS

→ The respondents are interested to contribute to the protection of the environment

→ They are able to convey the harmful effects of tobacco usage to their friends and influence very few to stop the usage of tobacco

→ The respondents do know that there are laws to protect the environment but not in detail

→ The respondents want to limit the usage of their cell phones as it causes harmful effects due to its radiation

→ The respondents also said that they have reduced the use of plastic covers in many places

CONCLUSION

The environment needs to be protected from various health hazards. It is the duty of each one of us to undertake measures that can contribute to protect the environment. It can also be in form of avoiding plastics for example and using paper bags or cloth bags instead. The study was able to find out the awareness of the respondents regarding the environmental health hazards and obtain suitable measures from the respondents for the same. This small study will serve as a small drop of rain that will help to make a healthy society.

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7.Questionnaire – On Health Hazards And Its Impact On Human Health

27. CLIMATE CHANGE: COPING STRATEGIES FOR A SUSTAINABLE FUTURE IN INDIA

Dr. (MRS) S.AMERJOTHY, Former Dean of Science, Presidency College, Chennai-5
Dr. RAJ BHARATH, R., Asst. Professor, Dept. of Transfusion Medicine,Tamil Nadu Dr.MGR Medical University, Chennai, India
PROF. RUDRAPPAN, D., President, AMECA, Ethiopian Civil Service University, Ethiopia

ABSTRACT

Today, human race faces many threats but none is greater than the climate challenge. I quote Ban Ki-moon, the Secretary General of UN, " climate change does not respect borders; it does not respect who you are-rich and, the poor, small and big. Therefore, this is what we call ' global challenges' which require global solidarity"-co-operation and collaboration among all people and all governments of the world. Our globe, is a world of looming climate challenges. Climate change is happening here and happening now. Hence, human beings should not become architects of their own destruction. With the available knowledge and tools, it is essential to reduce global warming in terms of the mitigation and adaptation strategies. Therefore, this paper delineates various climate change coping strategies followed all over the world with a detailed description of measures formulated and adopted in India.

INTRODUCTION

In 2006, Nicholas Stern, head of the United Kingdom's Government Economics Service presented his report on 'Economics of Climate Change' to the British Government where he has advocated climate change mitigation as one of the cardinal objectives (Stern, 2007). The Stern report stated that if we don't act, the overall costs and risks of climate change would be equivalent to loosing at least five per cent of global GDP each year now and forever. If a wider range of risks and impact is taken into account, the estimates of damage could rise to 20 percent of GDP or more. In contrast, the costs of action reducing GHG emissions to avoid the worst impacts of climate change can limit to around one per cent of global GDP each year. Therefore, all out efforts have to be taken for climate change mitigation globally in view of its low cost and high benefit in terms of job generation and sustainable economic development(Rudrappan,2004). A sustainable emission pathway will be meaningful only if it is translated into practical national strategies and national carbon budgets among all countries. Many European Union countries have credible targets with a few countries like Canada and USA fall short of the target laid down under the Kyoto Protocol.

OBJECTIVES

The objectives of the paper have been listed below

To find out the causes of climate change and the extent of destruction caused by climate change, and

To suggest remedial measures in terms of mitigation and adaptation for reducing climate change extreme events.

METHODOLOGY

Descriptive study is adopted using secondary data for outlining causes and catastrophes of climate change in addition to explanation on various measures formulated and followed by the Governments both at the Centre and States.

Discussion

Usually, changes in the climate system occur slowly and are responsible for the existing bio-diversity on the planet. However, the last few decades have seen rapid changes in this phenomenal world such that flora and fauna have not been able to adapt to changing climate. Human activities are largely responsible for this and human induced climate change has been widely recognized as one of the major problems threatening the earth today. Though natural events such as volcano eruption and solar radiation contribute to some extent in increasing the global temperature, the rise is caused mainly by greenhouse gases such as carbon dioxide, methane, water vapour and other gases as a result of human activities induced factors. The present global warming is a phenomenon where there is an increase in earth's surface temperature leading to a change in global climate, melting of ice glaciers and consequent increase in the sea level. Ozone depletion in the troposphere which is the lowest part of the earth atmosphere also contributed to warming of earth surface. Preventing dangerous climate change is the agreed ultimate objective of climate policy formulated in the 1992 U.N. Framework Convention on Climate Change. (UNFCC) through mitigation and adaptation strategies.

Climate change mitigation target should also be transformed into policies which are considered more challenging politically. The starting point of mitigation is putting a price on carbon

emissions in the following two ways:

1) Tax on carbon dioxide emissions which could be used to support wider environmental tax reforms.

2) Cap-and–trade where the government seeks an overall emission cap and issues tradable allowance that grant business the right to emit a set amount (Christopher & Robert, 2009).

Those who can reduce emissions more cheaply are able to sell these allowances. Therefore, carbon markets are an essential condition for the transition to lower level carbon economy. Moreover, the governments have a critical role in fixing regulations and in supporting research and development for a carbon neutral economic growth. The USA has used tax instrument to increase the development of renewable wind power energy source. IPCC has advocated enhanced energy efficiency to reap double dividend not only by lowering carbon dioxide emissions but also reducing energy cost in sectors like automobile. The automobile sector which accounts for more than 30 per cent of green house emissions in rich countries, adoption of regulatory standard is a must to unlock double dividends.

In addition to this, international trade could also play a major role for the development of alternative fuel such as ethanol which is more efficient in cutting carbon emission as seen in Brazil. Another key for mitigation is carbon dioxide capture on storage (CCS) which helps coal fired power generation with mere zero emission. This cutting edge CCS technology should be developed further as a costless method and deployed more rapidly around the world. Adaptation of climate mitigation policies requires proper planning and implementation capacity. However, the capability is lacking in poor countries as a result of absence of social protection, insufficient infrastructure and inadequate climate related risk information.

ADAPTATION STRATEGY TO REDUCE THE RISK OF CLIMATE CHANGE

Response to global warming requires immediate curtailment in the level of future climate change through adaptation. The aim of adaptation is to increase the climate resilience of communities by enhancing their capacity to cope with less predictable rainfall patterns, more frequent droughts, stronger heat wave, different diseases and weather hazards. It is the responsibility of all governments to develop strategies and projects that will enable people to cope with changes occasioned by climate change. Several countries have been implementing adaptation projects for building resilience among the people through federal, state, local governments as well as with the help of non-governmental organizations and local community groups. The adaptive capacity of a country depends on five forms of livelihood capital- physical, natural, social, human and financial capital as well as on access to technology, access to information on climate variability, capacity of institutions, equitable distribution of resources, and international cooperation. However, in view of the inadequacy of above factors among poor countries, many African and Asian countries are not able to build up adaptation capacity of communities sufficiently (Rudrappan,2010).

CLIMATE CHANGE ACTION PLAN IN INDIA

After climbing up steadily for at least two decades, India's green house gas emission began to decline rapidly after 1995 suggesting the start of decoupling process of environmental challenges and economic growth, as has occurred historically in rich countries at higher per capita income levels in terms of Kuznets inverted 'U' shaped curve. India's per capita emission ranks among the lowest averaging only 25% of the world and 5 % of USA's present emission. Furthermore, pressure from citizens activists and Government's policies driven by environmental challenges have reduced green house gas emission (Rudrappan,2011).

In terms of UNFCC accord, Kyoto Protocol, Marrakesh, Copenhagen and Cancun agreements signed so far, several measures are being undertaken in India, which contribute to GHG mitigation. Some of them are:

1.Establishment of the Technology Information, Forecasting and Assessment Council under the Department of Science and Technology, which facilitates the transfer of environmentally sound technology.

2.Extensive efforts in conservation of forests and biodiversity.

3.Involvement of a number of governmental and independent agencies in climate change research in India.

4.Using satellite data received from INSAT, cloud imageries will be projected. This will be used to derive cloud motion vectors, sea surface temperatures, and outgoing long wave radiation which in turn would be utilized for formulating mitigation measures.

To achieve the above mitigation strategy, following eight Missions have been established focusing on promotion of understanding of climate change, adaptation, mitigation, energy efficiency and natural resource conservation.

1.National Solar Mission: In view of India's position in the equatorial Sun Belt getting abundance of solar power throughout the year, generation of more solar power has been given much importance.

2.National Mission for Enhanced Energy Efficiency: The industrial sector of India which has been consuming 42% commercial energy emits 31% of total CO2. Therefore, the mission aims at increased energy efficiency in this sector.

3.National Mission on Sustainable Habitat: The aim of the Mission is to make habitats more sustainable through improvements in energy efficiency of buildings to achieve 30% electricity savings in new buildings, management of Municipal Solid Waste (MSW) and urban public transport

4.National Water Mission: As water becomes a scarce resource, the National Water Mission aims at conserving water, minimising wastage and ensuring more equitable distribution through Integrated Water Resource Management and modern irrigation techniques.

5.National Mission for Sustaining the Himalayan Ecosystem: Land-use planning and water-shed management practices for sustainable development of mountain ecosystems have been formulated.

6.National Mission for a Green India: Aiming at enhancing ecosystem services such as carbon sinks, it provides for Green India campaign for the afforestation of 6 million hectares and the national target of increasing land area under forest cover from 23% to 33%.

7.National Mission for Sustainable Agriculture: The objective is to make Indian agriculture more resilient to climate change by identifying new varieties of climate resilient crops, especially thermal resistant ones and alternative cropping patterns.

8.National Mission on Strategic Knowledge for Climate Change: Apart from usual budget grants, the mission aims at establishing a special Climate Research Fund also to promote research in climate change and related field in collaboration with global community.

Implementation: Each mission has to be implemented by the respective ministries and the progress made by them would be submitted to the Prime Minister's Council on Climate Change annually for evaluation. Further, India is an active participant in the Clean Development Mechanism (CDM) established by the Protocol and has more than 500 registered CDM projects accounting for about a third of all global projects and most of them are bio-mass and renewable energy projects. Under a CDM project, all incandescent bulbs in residences will be replaced into compact fluorescent bulbs. The price differentials will be recovered by the role of carbon credits. It is estimated that this will reduce 24 million tons of CO2 annually.

Under transportation, the government has directed all new four wheeled vehicles should comply with Euro IV standard emission norms and heavy vehicles should use Compressed Natural Gas (CNG) in big cities. For mass transit in urban areas, metro railways are being built up. The government also has introduced bio-fuel in the form of ethanol-blended gasoline and provides incentives for the production as well as commercialization of bio-fuels.

CONCLUSION

The "Perform Achieve and Trade"(PAT) scheme launched in April 2011 is an energy saving mechanism based on emission certificates targeting key industrial sectors with trading scheme. Despite no binding emission targets, Government of India acknowledged that it has a major role to play in global mitigation efforts in line with the principle of common but differentiated responsibility and respective capability. In spite of being the second largest polluter of greenhouse gases of the world, the USA has not realised its shared global responsibility and its President Donald Trump has withdrawn from the commitment of financial help to poor countries to overcome climate disasters as well as from the global climate Paris Accord, signed by all countries in 2015. As such, India magnanimously took on the voluntary target of reducing its carbon intensity by 25%. India's vision is to build a self-sustaining prosperous economy in terms of its capacity to unleash the creative energies of its people and the country is mindful of its responsibility to the present and future generation.

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28. MITIGATING THE RISK OF DISASTER THROUGH COMMUNITY ENGAGEMENT AND DISASTER PREPAREDNESSTRAINING – WITH A SPECIAL REFERENCE TO SAMIYARPETTAI- A MODEL VILLAGE AT CUDDALORE DISTRICT, TAMILNADU.

RAJANJAYABALAN, Asst. Prof & Head, PG Department of Social Work, DRBCCC Hindu College, Chennai. South India. Email: rajanjayabalan@gmail.com.

ABSTRACT

This paper analyses; how the community based approach and orientation on Disaster mitigation and preparedness program has tremendously helped the communities to survive through the course of natural calamities, such as Tsunami. Furthermore, the paper engages to study the effectiveness of community engagement and their active participation in the Disaster mitigation management program. In turn how,the program devolved the community members to take precautionary action and as a result to safe guard their lives from the perilous disaster situations. Taking the" Samiyarpettai" – a small marine village exist in coastal line of Cuddalore district, Tamilnadu, as a special reference. And how the initiative in disaster management training to the people of Samiyarpettai has empowered to survive when tidal waves of tsunami struck the village in 2004,Dec.

KEYWORDS: Community Engagement, Vulnerability, Mitigation.

INTRODUCTION

Thirty five years ago (Maskey 1984) the paper on community based hazard mitigation was presented in the proceedings of International Conference held in OchoRios. The presentation gained its significance as engagement of communities has been the key factor to reduce the risk of the disaster. The paper stresses the involvement of community should be regarded as foremost and inevitable approach to mitigate any life- threatening disaster,

Through this paper, we focus to throw light upon ; why the poor rural communities are vulnerably exposed to the natural disaster.? There are various characteristics which could be deemed as reasons. The vital among the different factors which has been indicated; that is inequalities in socio- territorial resources. To be more specific and clear the resources pertaining to social needs, safety of territorial living and social infrastructure were not distributed in the equitable mode. The poor communities who had occupied the disaster-prone areas left with no other alternatives for secured and safer living. They were marginalized to be habituated in the undervalued lands, hazard prone sites and to built housings which are fragile and vulnerable to disaster.

In the essence of disaster management, it is necessary to analyse the system of resource distribution and other social issues that has pushed the majority of the marginalized rurals to become victims of natural disaster.

IMPERATIVES OF COMMUNITY ENGAGEMENT

In order to reap the effective results through Disaster Preparedness training , the communities need to be actively engaged with a clear framework instructing with indicators: What can be achieved as a community with the initiatives that reflects ownership. To understand community engagement, we need to look through the lens of research orientation. It is defined as " Community Engagement is the process of working collaboratively with and through groups of people affiliated by geographic proximity , special interest , or similar situation to address the issues affecting the well-being of those people , it is a powerful vehicle for bringing about environmental and behavioural changes that will improve the health of the Community and its members it often involves partnership and coalition that help to mobilize resources and influence systems , change relationship among partners and serve as catalyst for changing policies, programs and practices(CDC 1997)

Community based approach grounds on the principle of consultation,involvement, information and empowerment. Community Engagement can be envisaged as multi-dimensional concept that can be identified in the above-mentioned perspectives. The baseline model for community approach must focus on long term -sustainable engagement. To intersect community and engagement, the prime focus must concentrate to reform from "individuality to inclusivity'. The inclusiveness must ensure diversity within any community.

In building relationships within community 'trust' takes the crucial place for its long term and successful engagement. Without purposeful establishment of trustful relationship, bonding of community may fail, thus leading to the infractions in the development process of community engagement.

Throughout the formal initiation of community engagement , the channels of communication plays instrumental role in determining the definitiveness of trust building. The propensity of effective communication ensures the long term engagement of the community. The most inevitable factor that encounters community engagement could be 'conflict' which would have been ignited by value clashes and disagreements , these two dimensions has proved to be crucial facets of community conflicts. Immediate address to the frictions of conflict would comprehensively determine the progress of community building.

In the context of community and engaging it constructively in disaster mitigation can be possibly achieved by building their capacities, ultimately strengthening its preparedness. In such a way gaining the capacity to undertake localized disaster mitigation mechanism, such as ensuring accesses to safe land area and availing the service of public works department ensures mitigation to avert the risk of disaster.

In the attempt of engaging communities in the process of mitigating disaster, the two components have to be taken into account. First, development of socio-cultural and political baseline. The communities which are identified as poor and vulnerable and seek resolutions to their local problems ,such as related to the basic standards of living and the socio-political risk factors ,also unemployment , poverty , communal clashes and intolerance. Second, persuade community participation in the government -based disaster mitigation programs. For example: Samiyarpettai – a remote coastal village of Cuddalore district and its community's active participation in disaster mitigation programs which has enabled the village of samiyarpettai to reduce considerable death toll during the tsunami of 2004 Dec., on the other hand which had caused irreparable damages to many villages of the Indian Ocean.

SOCIO-ECONOMIC STATUS OF THE HAZARD PRONE COMMUNITIES

In the light of socio-economic status the interaction within the community and other groups reflects to be the underlying element of community based approach. The harmonizing parameter which are highly relevant for identifying the socio-economic factors have been included,such as : social cohesion ,team spirit, responsiveness towards the mechanism of evacuation , traditional skills and intermixing with the community.

In the milieu of coping capacity, it differs from house to house in the existing community. The indicator such as promise for employment, when they have been evacuated to different habitation, certain household may incline positively for such policies, whereas on the other hand there are households which could be non-receptive.

The degree of intermixing among the community members varies from moderate to poor. In connection with the small marine villages which are on the coastal line of the Cuddalore district, a study reveals that twenty percent of the household in Madhavapallam habitation are willing to take up community responsibility. In contrast the other coastal villages such as Annappanpettai, Velinganpettai, almost all house holds were considerably willing to engage as community thereby taking responsibilities with an ownership attitude to overcome the risk of natural disaster, such as tsunami.

The villagers assemble for informal meetings to discuss about risk exposure and design survival strategies to mitigate disaster. Regarding vulnerability , there is a dynamic phenomenon which is oriented in the aspect of how it is modified in the in the shorter duration. Although , the initiatives of the community is effectual ,but their predominant expectation lies on the administrative authorities need to interact and consult the respective communities before establishing policies , plans and programs and monitoring of the disaster mitigation planning.

The criterion of the community engagement can be stabilized through participatory and transparent approaches. Taking these small marine villages into consideration the majority of the households are assured of source of employment except Annappanpettai and Samiyarpettai.

RANGES OF VULNERABILITY AT THE HABITATIONS OF THE COMMUNITY

The early warning of disaster for coastal villages are generally communicated to the community through various media such as community leaders , television media , over the telephones from friends and relatives. Predominant members of the population have been responsive to the early warnings and takes precautionary steps to move to the safer places. The habitation area of the coastal villages of Cuddalore maximizes its rescue operations with trained manpower and provides shelters sufficiently up to the range of twelve habituating villages.

The local authorities are capable to provide safe drinking waters,emergency first aid assistance,

food grains and kerosene in the event of disaster . Mock drills are regulated .In the context of vulnerability index among marine villages : Samiyarpettai and Pudupettai found to be in acute level. The study also reveals that Samiyarpettai is found to be most vulnerable habitation in the year 2010-11. Through the sensitization program and disaster risk management training offered to the community ofsamiyarpettai under UNDP -initiatives have reduced loss of lives ,when tsunami struck in 2004. Samiyarpettai suffered less death toll as compared to nearest Pudukkupam which had identical size and habituation of Samiyarpettai. This implications only indicates that vulnerability is at lower range when the community is better prepared and equipped in the event of Natural Disaster.

5.Samiyarpettai- a Model village in Mitigating Disaster- Tsunami(2004).

Samiyarpettai , a marine village exist at the coastline of of Cuddalore district, Tamil Nadu. It is considered as small village with the habitation of less numbers of households compared to other villages that is surrounded. Although , tsunami which struck Samiyarpettai in 2004 , it could only devastate the Catamarans, fishing boats and the living houses. But the lives of the people were considerably saved from the ferocious tidal waves . There were only less number of death toll which were counted up to 30.

The UNDP – funded (United Nation Development Program) ' Disaster management and Mitigation Awareness Program' organized to impart an effective design of the training module to the people community of Samiyarpettai. The people's active involvement and participation in the training sessions paid a rich dividends at the time of Tsunami Attack. The villagers took precautionary measures through the enlightenment received from the Disaster Mitigation Program.

The community of Samiyarpettai adopted the ability in sensing the early signals of the tidal waves on the previous day. The members of the community prudently shifted to the safe zone and other shelters as oriented and trained in the Disaster Mitigation Program. Even the assistant Collector of Cuddalore"Anu George" pointed out that Cuddalore is one of the seven districts among various other districts identified as multi-hazard prone zone.

The villagers of Samiayarpettai were approached to adhere Community Engagement process, thereby forming several groups which were trained in the context of easy- to -follow rescue operations. The other needs like food, provisions , mobile phones and vehicle facility arrangement responsibilities were taken care by the respective groups.

The surrounding villages of Samiayarpettai such as Puthukuppam, Parangipettai experienced heavy death toll . Unlike those villages Samiyarpettai attributed to lower death rate ,because of the training imparted on Disaster Management. The folks of the village testified that training on how to mitigate disaster and natural hazards proved to be highly effective as enhanced the capacity of the community to protect the lives from the devastating tsunami,2004 Dec

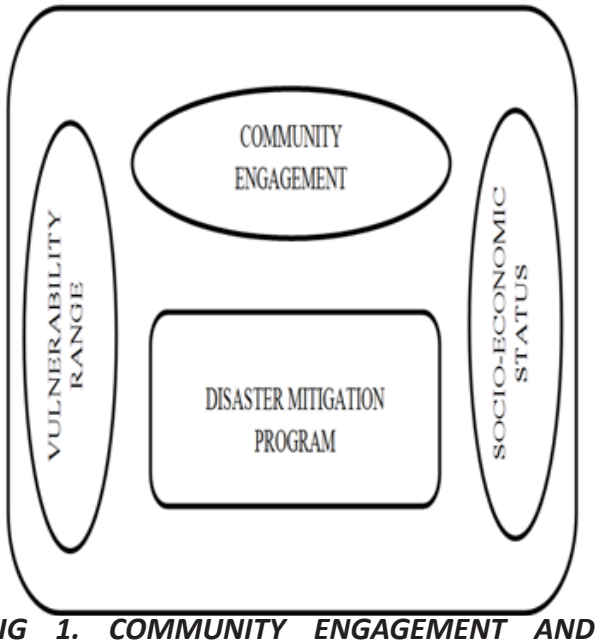

FIG 1. COMMUNITY ENGAGEMENT AND DISASTER PREPAREDNESS

CONCLUSION

The natural disasters are unavoidable , it is not about that the disaster could be prevented but the degree of vulnerability such as loss of lives and livelihood can be reduced . Considering, the model village that of samiyarpettai , the disaster of tsunami was mitigated through disaster management program . The maximum number of death rate were reduced through such " Disaster Preparedness Initiatives". This paper suggest a constant preparation through training on disaster management, in the process of Community Engagement which shall produce effective results in managing the natural hazards

Furthermore, through this paper, we efforted to envisage the effective community engagement must be locally based and active partnership between government authorities and communities have proved the effectiveness of sustainable disaster mitigation. The success of reducing the risk of disaster at hazard

prone zones could be evidently possible by establishing Community Engagement process and preparedness training to mitigate the disaster such as Tsunami of 2004 Dec.

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5.Development of habitation vulnerability assessment framework for coastal hazards: Cuddalore coast in Tamil Nadu, India—A case study S. Saxenaa, V. Geethalakshmib,n, A. Lakshmananb.

29. IMPACT OF URBANISATION AND ITS EFFECT ON COASTAL COMMUNITIES IN CHENNAI REGION

SAMA A, Ph.D Research Scholar, PG & Research Department of Economics, The New College (Autonomous), Chennai-600014.sama.crem@gmail.com.

Dr. M. ABDUL JAMAL, Assistant Professor & Research Supervisor, PG & Research Department of Economics, The New College (Autonomous), Chennai-600014. abduljamal@gmail.com.

ABSTRACT

Impact of Urbanisation in India is the process resulting into increase in the proportion of urban population to the total population in an area. The coastline of India is characterised by several ecosystems and resources. The population in cities is generally increasing because they provide easy access to ocean, rivers beaches and other natural areas and are a good source for raw material and food. In India, Chennai is the fifth-largest city and 36th-largest urban area by population in the world. The Quality of Living Survey rated Chennai as the safest coastal city in India. As a growing metropolitan city in a developing country, Chennai confronts substantial pollution and other logistical and socio-economic problems. The objective of the study is to identify the environmental pollution hotspots and preparing an environment management plan that includes rehabilitation and mitigation measures. The study draws the importance to maintain a balance between the ecology and economy in the region to ensure sustainable development. On the other hand, suggesting the measures to face the problems related to salinity ingress in land and water resources, depletion and degradation of coastal ecosystems and natural resources, pollution of resources like sewage intrusion, garbage disposal, etc, which have impacted on the life and livelihoods of people in multiple ways. Innovative approaches are needed to regulate the processes of salinisation and to manage to live with it since it cannot be eliminated.Keywords: Impact of Urbanisation, Coastal Environment, Sustainable Development.

INTRODUCTION

Urbanisation has become a common feature of Indian society. Growth of Industries has contributed to the growth of cities. As a result of industrialisation people have started moving towards the industrial areas in search of employment. This has resulted in the growth of towns and cities. Urbanisation can also be defined as a process of concentration of population in a particular territory. In India, the urban population during pre-independence time was 13.9 percent (1941) which rose to 17.3 per cent (1951) after the independence. The rise in urban population during the decades kept growing and by 1991 it reached 40 per cent. This count increased to 28.53% according to 2001 census, and crossing 30% as per 2011 census, standing at 31.16%. Before the independence of the country nearly 15 percent people were living in towns, and now their share has become more than double. The reasons in increase of the urban proportion of the total population may be very many, but mainly the Indian urbanization is the result of movement of rural population to urban areas.

The definition of "urban" apart from size and density specifies that 75 percent of the workforce should be engaged in non-agricultural pursuits. Hence infrastructure has to be planned not only for the population per se but also according to the requirements of the economic sectors in terms of water supply, waste disposal, power, telecommunications, etc. The higher density of urban areas is an advantage because it may provide economies of scale in the provision of these and other urban services.

Table 1

Urban Population of Tamil Nadu			
	2001	2011	Variation
No. of Districts	30	32	2
No. of Sub-Districts	201	215	14
No. of Towns	832	1097	265
No. of Statutory Towns	721	721	0
No. of Census Towns	111	376	265
No. of Villages	16317	15979	-338

Table 2

Percentage of Urban Population	
2001	2011
44.04	48.45

Table 3

Overall Urban Population of Tamil Nadu			
Persons	Rural	Urban	Total
Male	18663701	17495170	36158871
Female	18525528	17454559	35980087
Total	37189229	34949729	72138958

URBAN COASTAL REGION

Indian coastal region is highly heterogeneous and very complex. It possesses variety of resources, habitats and is also very rich in biodiversity, and can be considered as one of the most productive ecosystems on the earth. The Indian coastal region can be divided in three parts namely; the western coastal region, the eastern coastal region and group of Islands. The western coastal region is generally exposed to heavy surf and rocky shores. The eastern coastal region is generally shelving with beaches, lagoons, deltas and marshes.

The coastline of India is characterized by several ecosystems and resources. Such ecosystem is characterized by the several economic resources. In coastal districts, large economic activities are located. Coastal ecosystem protects the region from saline winds, cyclones, tsunami, waves etc. It promotes raw materials for the number of manufacturing activities. The population in cities is generally increasing because they provide easy access to ocean, rivers beaches and other natural areas and are a good source for raw material and food. In addition, they provide good access to jobs, employment, housing and port, access to a wider market etc. The coastal regions where land and water meet are ecologically dynamic and sensitive regions, as marine and coastal ecosystems continuously impact on each other. These regions are rich ecologically as they are home to a large variety of ecosystems, such as mangroves, water bodies, seaweeds coral reefs, fisheries and other marine life, and other coastal and marine vegetation. Coastal ecosystems protect the region from saline winds, cyclones, tsunami waves etc, promote carbon sequestration and promote biodiversity as well as provide raw materials for a number of manufacturing activities. Coastal regions are also attractive for carrying out major economic activities such as construction of ports and jetties, trade, ship building and ship breaking, large export based manufacturing including oil refinery and petroleum based industries, agriculture, tourism, aquaculture and fisheries etc, all of which are likely to put tremendous pressure on the coastal ecology. It is important therefore to maintain a balance between the ecology and economy in the region to ensure sustainable development. It is a big challenge to policy makers to promote economic growth in the region along with protecting and promoting the ecology of the region.

EFFECTS OF URBANISATION ON COASTAL REGION

URBAN POPULATION DENSITY: The density of population in urban areas not only reveals the concentration of people in urban areas but also highlights the structural condition of the town/ city. Although density is essentially the quotient obtained by division of the population of an area by the extent of the area, the resultant figure enables the following trend analyses while expressing the average population density of the area, it also reveals size and class distribution of the population. Difference in the density of population from the central area to the settlement fringes.

GROWTH OF SLUM: Slums are a formidable problem merely because the gap between resources and demand for shelter tends to exist perpetually. The urban poor by themselves can neither afford to build pucca house or spare the hard earned money for stay in rented houses with basic amenities. Such people encroach Government and private lands kept vacant. Many slums are situated in vulnerable locations like river margins, water logged areas, road margins, etc. The slum population prefers to live in unhygienic conditions and in areas prone to floods and accidents. It is estimated that more than 35 percent of the population of Chennai and more than 25 percent of the urban population of the State live in slums. The Tamil Nadu Slum Clearance Board and Public Works Department have jointly identified 33,313 families living on river margins and 8164 slum families squatting on the river beds in Chennai.

URBAN INDUSTRIAL POLLUTION: The high influx of population to urban areas, increase in consumption patterns and unplanned urban and industrial development have led to the problem of air pollution. The larger industries have a very high aggregate pollution potential. Analysis by CSE exposes steady and rapid increase in pollution levels, high local impacts and high traces of toxics making its air dangerous to breathe. Unlike other megacities, Chennai represents a different pollution challenge. Its annual average pollution levels though lower than other megacities still vary between moderate to critical. Without the sea breeze in this coastal city, the peaks could have been worse.

VEHICULAR EMISSIONS AND CONGESTION: Vehicles pose a special challenge. In terms of

actual exposure, people are more vulnerable to vehicular fumes while traveling and in close proximity to roads. Pollution concentration in our breath is 3-4 times higher than the ambient air concentration. In densely-populated cities, more than 50-60 percent of the population lives or works near the roadside where levels are much higher. The Ministry of Environment and Forests show vehicles contribute 14 percent of particulate matter and 68 percent of nitrogen oxides. Some other studies show that 35 percent of PM2.5 in Chennai comes from vehicles tinier the particles higher the share of vehicles. A study carried out by scientists of University of Berkeley published in Environmental Science and Technology in 2012 shows that the exposure to vehicular fumes (in terms of population-weighted intake fraction, or the grams of vehicle pollution inhaled per grams of vehicle pollution emitted) in Chennai (72) is one of the highest in cities studied in India – third after Kolkata (150) and Delhi (100).

SEWERAGE:Coastal waters receive a variety of land-based water pollutants, ranging from petroleum wastes to pesticides to excess sediments. Marine waters also receive wastes directly from offshore activities, such as ocean-based dumping (e.g., from ships and offshore oil and gas operations). One pollutant in the ocean is sewage. Human sewage largely consists of excrement from toilet-flushing; wastewater from bathing, laundry, and dishwashing; and animal and vegetable matter from food preparation that is disposed through an in-sink garbage disposal. The waterways of Chennai are not perennial in nature and receive flood discharge only during the monsoon season; the rest of the year these act as carriers of wastewater from sewage treatment plants and others.

SOLID WASTE DISPOSAL: Solid waste is generated in almost all parts of the urban areas and solid waste management becomes complicated in bigger cities. Collection, transportation and disposal of solid waste are the major operations involved in solid waste management. Everyday 4500 MT of garbage is collected and removed from the city. Night conservancy is being carried out in all important roads and commercial areas of the city.

IMPACTS OF URBANISATION ON COASTAL COMMUNITIES

Most coastal states in India have not been able to maintain this balance between economy and ecology, with the result that they are facing serious problems with respect to life and livelihood of coastal population on the one hand and sustainability of the development on the other hand. These areas are facing problems related to salinity ingress in land and water resources, depletion and degradation of coastal ecosystems and natural resources, pollution of resources etc, which have impacted on the life and livelihoods of people in multiple ways.

It appears that coastal livelihoods are threatened by a number of modern developments taking place on the coast. Some of the important developments are intensive agriculture, aquaculture, mining & quarrying, infrastructure development, industrial development, tourism and increasing urbanization. Intensive agriculture, encouraged under the green revolution has promoted the economic growth in these regions. However, the green revolution, which frequently resulted in excessive use of fertilizers, pesticides, improved seeds and irrigation, has affected ecology of coastal areas adversely. Ingression of salinity and alkalinity in land and water, eutrophication, depletion and degradation of ground water etc. are some of the adverse effects of intensive agriculture that did not take adequate care of land and water resources.

The sustainability of livelihood in agriculture on the one hand and resulted in shortage of potable water supply on the other hand. Aquaculture development is another important development that has contributed to economic development of this region, particularly in Tamil Nadu. Some of the adverse effects are destruction of mangroves; seawater ingression through shrimp farms and overuse of groundwater if shrimp plant is dependent on groundwater. These have resulted in exposing the coast to strong winds, storms and tsunami waves, affecting adversely the safety and security of coastal populations.

Mining and mineral based industries, other industries and infrastructural projects like ports and jetties, highways etc on the coast. However, wrong locations and excessive scale of these activities as well as unsustainable methods of disposal of discharges have frequently led to excessive salinity as well as excessive pollution of land, air and water resources in this region. The higher incidence of urbanization, which is a consequence of these developments, has once again raised pressure on natural resources and impacted adversely on coastal livelihoods of people when it is accompanied by unsustainable use of natural resources.

The impacts on coastal resources, the increased salinity of land and water is an important impact, as (1) it is widespread covering a large number of coastal districts and states, (2) it has impacted significantly on coastal livelihoods in most states and (3) innovative approaches are needed to regulate the processes of salinization and to manage to live with it since it cannot

be eliminated. There is a need therefore to have comprehensive view of coastal salinity to have a proper understanding of this important phenomenon. This understanding will provide useful insights into the problem, and help in formulating policy and programmes to deal with salinity effectively, and to protect and promote livelihood of people in salinity affected areas.

- Chennai's STPs are all situated at the far corners of the city. Wastewater is pumped across the city to these plants located on the outskirts. This would make eminent sense if the treated wastewater was reused in nearby areas, for irrigation or by industries. Instead, the bulk of the treated and clean wastewater is disposed off into rivers and canals, which traverse the entire length of the city (carrying this wastewater) before flowing into the sea.

FINDINGS AND SOLUTIONS

- Chennai's much vaunted sewage treatment infrastructure, its waterways continue to receive sewage from the colonies and industries along their way. In 2000, some 532 MLD of sewage was generated in the basins of Chennai's water bodies.
- Coastal waters receive a variety of land-based water pollutants, ranging from petroleum wastes to pesticides to excess sediments. Marine waters also receive wastes directly from offshore activities, such as ocean-based dumping (e.g., from ships and offshore oil and gas operations). One pollutant in the ocean is sewage. Human sewage largely consists of excrement from toilet-flushing; wastewater from bathing, laundry, and dishwashing; and animal and vegetable matter from food preparation that is disposed through an in-sink garbage disposal
- The waterways of Chennai are not perennial in nature and receive flood discharge only during the monsoon season; the rest of the year these act as carriers of wastewater from sewage treatment plants and others. Everyday 4500 MT of garbage is collected and removed from the city. Night conservancy is being carried out in all important roads and commercial areas of the city.
- Collection of Municipal Solid Waste at source(Door to door collection) has been implemented in all Zones. About 95% of the households were covered under this programme. This has been achieved only on introduction of Tricycles which stands as a wonder tool for better collection of MSW at door steps. Now about 2800 Tricycles are put in use. This has resulted in reduction of dust bins on road side.
- Over the last two decades share of bus, train and bicycle ridership has dropped drastically in the city. The share of personal vehicles trips have increased. Cycle rickshaws have totally vanished from the city, negatively impacting the last mile connectivity. Significant increase noted in the share of two wheeler trips followed by car trips.
- The Chennai Metropolitan Area (CMA) covers some 1,189 sq km, of which the city limits are a mere 176 sq km. The sewage generated by this gigantic extended area flows into the same waterways, which get heavily polluted before they even enter the city limits.
- Chennai Metro Water has had the advantage of being a public utility which has kept a reasonably good control over its finances. But its increasing dependence on more expensive water projects will jeopardise this position. Its cost of water is increasing and this should be a source of worry for its planners – particularly as it charges high rates from consumers and still needs huge investments in managing sewage.
- Chennai had some past experience in using seawater for drinking. MetroWater built a battery of reverse osmosis plants in the colonies along the sea, mostly inhabited by fisherfolk. The aim was to provide drinking quality water from a source close to where people live. These plants are small, built specifically for drinking water of local communities.
- The reuse of sewage and wastewater for industrial and even domestic water use is another option worth exploring. Chennai has the distinction of having the country's first recycling project – the city's sewage was sold to the Chennai Petroleum Company Limited (CPCL), which in turn used reverse osmosis technology to filter the sewage and turn it into water for its use. This industry found sewage more reliable than water and the costs were low as compared to its use. This approach to turn waste into wealth needs to be promoted in this city of water stress and scarcity.
- Centre for Science and Environment checked out the impact of car centric infrastructure on pollution and carbon emissions in a few locations. This is diagnostic. Car centric infrastructure (signal free roads, flyovers and foot over bridges etc) increases interferes with walking accessibility, increases travel distances, encourage more motorized travel, and lead to more emissions.
- The population exposed newer challenges like ozone, PM2.5 and toxics. It should strengthen its monitoring grid, deploy air quality forecasting modes, must regularly and systematically monitor the health indicators. At the same time implement an air quality index system and health advisory for informing people about ill effects of poor air quality.
- The standards have been made by the

ministry of urban development to provide for compact, high density, mixed land use development near new or existing public transportation infrastructure that includes housing, employment, entertainment and civic functions within walking distance of transit.

- Chennai MetroWater is set to receive Rs 4 crore every year from a United Nations body to implement environment-friendly projects. The financial incentive is for developing renewable energy sources that offset the use of fossil fuels. The water agency would be presented 'carbon credits' for generating electricity from biogas to operate its sewage treatment plants in the city.
- The water supply system of the metropolitan area of Chennai is facing problems due to high groundwater abstraction and progressing salt water intrusion. To increase groundwater recharge, several check dams have been constructed in this area. A supporting analysis and planning tool has been developed for long-term analysis of managed aquifer recharge measures. An increase in groundwater levels was verified, but a reduction of the current abstraction rate is necessary for a sustainable management of the water resources.
- The declining levels of ground water indicates that many of the rain water catchments are in degraded state and their holding capacities have been reduced considerably due to factors like siltation, encroachments, conversion of rain water holding structures for other uses, etc. It is therefore necessary that this dangerous trend of degeneration is halted and immediate remedial measures should be undertaken.

CONCLUSION

The study has brought out the factors that draws the importance to maintain a balance between the ecology and economy in the region to ensure sustainable development and has highlighted the effects and the pressure of population, dependence of coastal communities, sewerage mixing with the river water bodies and how polluted water reaches the sea. This study emphasizes to identify the environmental pollution hotspots and preparing an environment management plan that includes rehabilitation and mitigation measures. Urbanisation has its own merits and demerits. Urbanization can't be avoided. But the negative effect of urbanization can be minimised. The Government proposes to enlist the participation of the Public and Non-Governmental Organisations (NGOs) in propagating and installing rainwater-harvesting structures. The study has suggested the measures to face the problems related to salinity ingress in land and water resources, depletion and degradation of coastal ecosystems and natural resources, pollution of resources like sewage intrusion, garbage disposal, etc, which have impacted on the life and livelihoods of people in multiple ways.

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30. CLIMATE CHANGE AND ITS IMPACTS ON MARINE FISHERIES LIVELIHOOD – A SPECIAL VIEW ON ERIPURAKARAI VILLAGE

M.SANTHANARAJ, Assistant Professor of Economics, Raja Serfoji Govt. College (Autonomous)Thanjavur-5.

ABSTRACT

Eripurakarai is a large village located in Pattukkottai Taluk of Thanjavur district, Tamil Nadu with total 995 families residing. The Eripurakarai village has population of 4285 of which 2047 are males while 2238 are females as per Population Census 2011. In Eripurakarai village population of children with age 0-6 is 554 which makes up 12.93 % of total population of village. Average Sex Ratio of Eripurakarai village is 1093 which is higher than Tamil Nadu state average of 996. Child Sex Ratio for the Eripurakarai as per census is 1037, higher than Tamil Nadu average of 943. Eripurakarai village has lower literacy rate compared to Tamil Nadu. In 2011, literacy rate of Eripurakarai village was 74.51 % compared to 80.09 % of Tamil Nadu. In Eripurakarai Male literacy stands at 82.59 % while female literacy rate was 67.18. In Eripurakarai village out of total population, 1548 were engaged in work activities. 95.54 % of workers describe their work as Marine Work (Employment or Earning more than 6 Months) while 4.46 % were involved in Marginal activity providing livelihood for less than 6 months. Of 1548 workers engaged in Main Work, 12 were cultivators (owner or co-owner) while 300 were Agricultural labourers.

The Marine Education Trust has produced a new education pack called Explore the Sea, which is a series of resources for young people that is intended to be very practical and hands-on while not requiring a great deal of additional equipment or materials. It's not meant to be a course, just ideas that can be mixed, matched and adapted depending on what individual organization need at the time. Explore the Sea is a resource pack containing a series of practical activities to teach young people about the different habitats, marine life and environmental pressures affecting tropical coral reef ecosystems. It is arranged in seven topic areas that cover five particular ecosystems (reefs and lagoons, sandy beaches, rocky shores, mangroves and the open ocean) as well as introducing general ecological concepts and highlighting important conservation concerns.

According to Census 2011 information the location code or village code of Eripurakarai village is 614701. Eripurakarai village is located in Pattukkottai Taluk of Thanjavur district in Tamil Nadu, India. It is situated 14km away from sub-district headquarter Pattukkottai and 61km away from district headquarter Thanjavur. As per 2009 stats, Eripurakkarai is the gram panchayat of Eripurakarai village. The total geographical area of village is 829.27 hectares. Eripurakarai has a total population of 4,285 peoples. There are about 995 houses in Eripurakarai village. Adiramapattinam is nearest town to Eripurakarai. There are 105 craft owners in Eripurakarai. The craft owners comprise of two categories viz., mechanized boat owners and country boat owners. Out of 105 craft owners there are 85 mechanized boat owners and 20 country boat owners. In Eripurakarai there are 250 middlemen. The middlemen comprise two categories namely wholesaler and retailer out of 250 middlemen there are 50 wholesalers and 200 retailers. The socio-economic condition of fishermen families in the study area is analyzed in the project. 50 fishermen are chosen at random for this study. These socio-economic conditions of their families are analyzed and focused in this study.

INTRODUCTION

According to Census 2011 information the location code or village code of Eripurakarai village is 614701. Eripurakarai village is located in Pattukkottai Taluk of Thanjavur district in Tamil Nadu, India. It is situated 14km away from sub-district headquarter Pattukkottai and 61km away from district headquarter Thanjavur. As per 2009 stats, Eripurakkarai is the gram panchayat of Eripurakarai village. The total geographical area of village is 829.27 hectares. Eripurakarai has a total population of 4,285 peoples. There are about 995 houses in Eripurakarai village. Adiramapattinam is nearest town to Eripurakarai. There are 105 craft owners in Eripurakarai. The craft owners comprise of two categories viz., mechanized boat owners and country boat owners. Out of 105 craft owners there are 85 mechanized boat owners and 20 country boat owners. In Eripurakarai there are 250 middlemen. The middlemen comprise two categories namely wholesaler and retailer out of 250 middlemen there are 50 wholesalers and 200 retailers. The socio-economic condition of fishermen families in the study area is analyzed in the project. 50 fishermen are chosen at random

for this study. These socio-economic conditions of their families are analyzed and focused in this paper.

The Thanjavur District lies between Bay of Bengal in East, Trichy district in the west, Pudukkottai District and Palk straight in the South and Arcot District in the North.

Thanjavur is the headquarters of the district. Nagapattinam district is one of the fishing harbors in Tamil Nadu.

OBJECTIVES OF THE STUDY

1.To study whether the mechanized boat owners are high in numbers.

2.To examine the educational background of the fishermen households in the study village.

3.To study the income and expenditure of the fishermen families in Eripurakarai.

HYPOTHESIS OF THE STUDY

1.Number of mechanized boat owners is higher than the traditional boat owners.

2.Educational background of the fishermen is poor in the study area.

When the Income increases the expenditure also increases in the study area. Population of ERIPURAKARAI

Total Population - 4,285

Male Population - 2,047

Female Population - 2,238

CONNECTIVITY OF ERIPURAKARAI

Type	Status
Public Bus Service	Available within <5 km distance
Private Bus Service	Available within < 5 km distance
Railway Station	Available within 500 metre distance

ERIPURAKARAI – POPULATION

Eripurakarai is a large village located in Pattukkottai Taluk of Thanjavur district, Tamil Nadu with total 995 families residing. The Eripurakarai village has population of 4285 of which 2047 are males while 2238 are females as per Population Census 2011.

In Eripurakarai village population of children with age 0-6 is 554 which makes up 12.93 % of total population of village. Average Sex Ratio of Eripurakarai village is 1093 which is higher than Tamil Nadu state average of 996. Child Sex Ratio for the Eripurakarai as per census is 1037, higher than Tamil Nadu average of 943. Eripurakarai village has lower literacy rate compared to Tamil Nadu. In 2011, literacy rate of Eripurakarai village was 74.51 % compared to 80.09 % of Tamil Nadu. In Eripurakarai Male literacy stands at 82.59 % while female literacy rate was 67.18 %. As per constitution of India and Panchyat Raj Act, Eripurakarai village is administrated by Sarpanch (Head of Village) who is elected representative of village. Our website, don't have information about schools and hospital in Eripurakarai village.

WORK PROFILE

	Worker (Among total population)	Main Worker (Among workers)	Marginal Worker (Among workers)	Non Worker (Among total population)
Total	36.1%	34.5%	1.6%	63.9%
Male	54%	52.7%	1.3%	46%
Female	19.7%	17.9%	1.9%	80.3%

In Eripurakarai village out of total population, 1548 were engaged in work activities. 95.54 % of workers describe their work as Marine Work (Employment or Earning more than 6 Months) while 4.46 % were involved in Marginal activity providing livelihood for less than 6 months. Of 1548 workers engaged in Marine Work, 12 were cultivators (owner or co-owner) while 300 were Agricultural labourers.

ERIPURAKARAI VILLAGE

	Total	General	Schedule Tribe	Child
Total	4,285	3,192	1,093	0
Male	2,047	1,526	521	0
Female	2,238	1,666	572	0

THE PURPOSE OF STUDY

The Marine Education Trust has produced a new education pack called Explore the Sea, which is a series of resources for young people that is intended to be very practical and hands-on while not requiring a great deal of additional equipment or materials. It's not meant to be a course, just ideas that can be mixed, matched and adapted depending on what individual organization need at the time. Explore the Sea is a resource pack containing a series of practical activities to teach young people about the different habitats, marine life and environmental pressures affecting tropical coral reef ecosystems. It is arranged in seven topic areas that cover five particular ecosystems (reefs and lagoons, sandy beaches, rocky shores, mangroves and the open ocean) as well as introducing general ecological concepts and highlighting important conservation concerns. The pack contains Educators' Notes, which provide background information about the different subject areas, and Student Sheets, which provide instructions for the activities. The activities range from art and science to

role plays, and are designed to be an ideas base rather than a comprehensive ecology course to follow. They are intended to be flexible – an activity suggested for one topic can easily be adapted for another – and should be appropriate for formal or informal education settings.

MANAGING THE MARINE ENVIRONMENT

Managing the marine environment can be a real challenge for politicians, as there are so many conflicting arguments about how seas and coasts should be used. The scientific evidence clearly shows that we need to use our oceans more sustainably: if we don't try to conserve marine species and habitats now, there will be little left for the future. In this activity, you will put yourselves in the shoes of people involved in making decisions about marine resource management. The scenario Lamorelle is a remote tropical island in the Indian Ocean. It is a small island, 12 miles long and 5 miles wide. The island is mountainous and rocky and is difficult to farm. Tobacco, coffee, limes and onions are grown to some extent. The weather is sub-tropical with occasional cyclones during the summer. However, water is very short due to poor collection and storage facilities. There are connecting flights to a nearby larger island twice a day and a ship that comes once a fortnight with essential supplies. The island has many beautiful beaches which have so far not been developed. Three hotels have been built on the island, but room occupancy is low. Since the island was first permanently settled in 1742, the islanders have relied to a large extent on the sea and lagoon for their subsistence and livelihood. As the population grew during the 18th and 19th centuries several large fishing operations established themselves on the island and caught large quantities of fish that they exported to the mainland. Now, many of the stocks have been fished out. The island was once rich in forest, but this was cut down by colonial navies on their way to the Spice Islands. Lack of vegetation has caused a large build up of silt and mud in the lagoon. The lagoon has been under increasing pressure recently. Silt has run off into the lagoon and smothered many corals. The lack of fish has led many women to start collecting octopus on foot, at the same time crushing corals. A new Government has just been elected with a bold new Chief Commissioner. He is keen to tackle decades of poor and inadequate management to ensure that fish stocks and the marine environment can be sustainably managed. He is also keen to ensure that there is a better economy on the island with more tourists and agriculture. In particular, the Government has been advised that the best way of managing resources is through the creation of a Marine Protected Area.

HUMAN PRESSURE ON ENVIRONMENT

Human pressure on the marine environment has brought several species to the edge of extinction. Their numbers have declined mainly as a result of fishing, which either targets the animals directly or catches them accidently when pursuing different species. Their survival is also threatened by the loss of their habitats – the places where they feed and shelter and where their young develop. Endangered marine species include turtles, whales, sharks and blue fin tuna. Our oceans, lagoons and shores have always provided a very wide range of different foods. Some of these foods remain very popular, like octopus curry in Mauritius, but sometimes people forget about the old ways. We must be very careful to exploit our resources sustainably so that they can still be used by future generations. One way to do this is to use lots of different species for food instead of just a few. There have been great changes in recent years in the availability of preserved foods, in refrigeration and in transport. With all these changes sometimes old traditional recipes and ways of using foods collected from the beach or lagoon can be lost.

IMPACT ON FISHING COMMUNITIES

Coastal and fishing populations and countries dependent on fisheries are particularly vulnerable to climate change. Low-lying countries such as the Maldives and Tuvalu are particularly vulnerable and entire communities may become the first climate refugees. Fishing communities in Bangladesh are subject not only to sea-level rise, but also flooding and increased typhoons. Fishing communities along the Mekong river produce over 1 million tons of basa fish annually and livelihoods and fish production will suffer from saltwater intrusion resulting from rising sea level and dams

While climate change increases the effects of human activities, the inverse is also applicable. Human activities also increase the impact of climate change. Human activity has been linked to lake nutrition levels, which high levels are correlated to increasing vulnerability to climate change. Lake Annecy, Lake Geneva, and Lake Bourget were subject to experiments related to their zooplankton. Lake Geneva and Lake Bourget had relatively high levels of nutrients and responded at a significant level towards factors related to climate change, such as weather variability. Lake Annecy had the lowest amount of nutrition levels and responded comparatively poorly. Fisheries and aquaculture contribute significantly to food security and livelihoods. Fish provides essential nutrition for 3 billion people

and at least 50% of animal protein and minerals to 400 million people from the poorest countries. This food security is threatened by climate change and the increasing world population. Climate change changes several parameters of the fishing population: availability, stability, access, and utilization. The specific effects of climate change on these parameters will vary widely depending on the characteristics of the area, with some areas benefiting from the shift in trends and some areas being harmed based on the factors of exposure, sensitivity, and ability to respond to said changes.The lack of oxygen in warmer waters will possibly lead to the extinction of aquatic animals Worldwide food security may not change significantly, however rural and poor populations would be disproportionately and negatively affected based on this criteria, as they lack the resources and manpower to rapidly change their infrastructure and adapt. Over 500 million people in developing countries depend, directly or indirectly, on fisheries and aquaculture for their livelihoods - aquaculture is the world's fastest growing food production system, growing at 7% annually and fish products are among the most widely traded foods, with more than 37% (by volume) of world production traded internationally.

ADAPTATION AND MITIGATION

The impacts of climate change can be addressed through adaptation and mitigation. The costs and benefits of adaptation are essentially local or national, while the costs of mitigation are essentially national whereas the benefits are global. Some activities generate both mitigation and adaptation benefits. Adaptation Several international agencies, including the World Bank and the Food and Agriculture Organization have programs to help countries and communities adapt to global warming, for example by developing policies to improve the resilience of natural resources, through assessments of risk and vulnerability, by increasing awareness of climate change impacts and strengthening key institutions, such as for weather forecasting and early warning systems. The World Development Report 2010 - Development and Climate Change, shows that reducing overcapacity in fishing fleets and rebuilding fish stocks can both improve resilience to climate change and increase economic returns from marine capture fisheries by US$50 billion per year, while also reducing GHG emissions by fishing fleets. Consequently, removal of subsidies on fuel for fishing can have a double benefit by reducing emissions and overfishing. Investment in sustainable aquaculture can buffer water use in agriculture while producing food and diversifying economic activities. Algal biofuels also show potential as algae can produce 15-300 times more oil per acre than conventional crops, such as rapeseed, soybeans, or jatropha and marine algae do not require scarce freshwater.

OVER-FISHING

Although there is a decline of fisheries due to climate change, a related cause for this decrease is due to over-fishing. Over-fishing exacerbates the effects of climate change by creating conditions that make a fishing population more sensitive to environmental changes. Studies show that the state of the ocean is causing fisheries to collapse, and in areas where fisheries have not yet collapsed, the amount of over-fishing that is done is having a significant impact on the industry. Over-fishing is due to having access to the open sea, it makes it very easy for people to over fish, even if it is just for fun. There is also a high demand for sea food by fishermen, as well modern technology that has increased the amount of fish caught during each trip. If there was a specific amount of fish that people were allowed to catch then this could very well solve the problem of over fishing. This type of limit system is in place in a few countries including New Zealand, Norway, Canada, and the United States. In these countries the limit system has successfully helped in fishing industries. These types of limit systems are called Individual fishing quota. This means that the areas where this quota exist, the government has legal entity over it and in these boundaries they are entitled to utilize their ocean resources as they wish.

SUGGESTIONS

There is a conservation issue called 'shifting environmental base lines'. This refers to the situation where each generation thinks that what is familiar to it is the natural state of the environment. In failing to take account of the experience of older people, we can miss the big picture and fail to appreciate the seriousness of environmental change. For this activity, you will be a fisheries scientist and do some research to record fishers' recollections of their catches in the past compared to those now. Talk to different fishermen (and women). Try to find the oldest fishermen you can, as well as some younger ones who have just started, and some in between. Write down the fisherman's age, and ask him about his catches. Ask what year he first started fishing, and then ask about the type of fish he caught, where he found them, and how big his catches were. Then ask the same questions about the situation now. Make a list of all the different sea foods that you have eaten Talk to your parents and grandparents

about the different sorts of seafood they used to eat. It might help to show them a book and get them to point things out Ask in particular how they used to cook them.

CONCLUSION

Eripurakkarai is the gram panchayat of Eripurakarai village. The total geographical area of village is 829.27 hectares. Eripurakarai has a total population of 4,285 peoples. There are about 995 houses in Eripurakarai village. Adiramapattinam is nearest town to Eripurakarai. There are 105 craft owners in Eripurakarai. The craft owners comprise of two categories viz., mechanized boat owners and country boat owners. Out of 105 craft owners there are 85 mechanized boat owners and 20 country boat owners. In Eripurakarai there are 250 middlemen. The middlemen comprise two categories namely wholesaler and retailer out of 250 middlemen there are 50 wholesalers and 200 retailers. The socio-economic condition of fishermen families in the study area is analyzed in the project. 50 fishermen are chosen at random for this study. These socio-economic conditions of their families are analyzed and focused in this study.

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31. ENVIRONMENTAL HAZARDS AND ITS IMPACT ON HUMAN HEALTH – A STUDY

PROF. Dr. V.N. PARTHIBAN, Ph.D., FCMA, FCS, FIII, FIIMM, C.A.(I),CFA, CPA, LLM, ML,MBA, MBL, MS., Associate Professor and HOD, Department of Commerce, Rama Krishna Mission Vivekananda College (Govt. aided) (Autonomous), Mylapore, Chennai-600 004.

ABSTRACT

In the name of progress or growth of industries, the business community has encouraged the coming up of the various industries using all sorts of chemicals mainly causing health problems to the human society. If any sensitive person raises any question about the health hazards that the science has brought in, the Government responds by various legislations, rules and regulations, guidelines and claims that these laws and rules would control and protect the health of the people. In this context, it should be emphasised here that every State in India is responsible for assuring and guaranteeing hygienic atmosphere and provide healthy environment for its citizens. Indiscriminate permissions to start polluting industries, not maintaining properly the sewerage system, disposal of solid waste, lack of facilities for storing the rain waters, disposal of waste and effluent, improper maintenance of rural lanes, bye-lanes and thickly populated urban areas are main reasons for creating health problem among the people. To make their living free from health hazards and create a peaceful atmosphere and thereby making our living peaceful and pleasurable and not painful and dreary. The Government must take it as its onerous responsibility by plucking into action rather than suggesting and taking without any practicable applicability. Serious steps should be taken, we cannot depend only on the law and State. People must come forward to help the Government. Let us unite to make our lives safe and peaceful by keeping our streets clean, atmosphere unpolluted so that health hazards can completely be prevented.

KEYWORDS: Environment; Health problems; Environmental hazards; Atmosphere; Government

INTRODUCTION

The enormous growth in population at world level has brought in several problems to the Governments of various countries. There was a time when there was no use for the term 'pollution'. The air was pure, the water was clear, the farm was green, and the sky was blue. But all these have changed today. This is mainly due to chemical, biological, physical and environmental pollution. Very recently, our country experienced very serious consequences of the gas leak disaster in Bhopal, Madhya Pradesh. Earlier, the fair world had witnessed during the world war, the droppings of atom bombs. Today we have biological and chemical weapons that can destroy the whole world in a fraction of a second. Not only the world gets destroyed but there will be a great vacuum on the earth. Another important problem which the world faces today is the health problems faced by majority of the people due to malnutrition or spurious food stuff or irregular food habits of the people and mainly due to unauthorised manufacturing of dangerous medicines. The report shows that there has been a steady growth of cancer among the people in the world today. It is quite strange that the medical scientists have miserably failed to identify the causes and cure for cancer. .

The ordinary people attribute this disease to the sins committed by them in earlier birth, subject to earlier birth being in doubt. There is what we call 'frustration amalgamated' in the world today, due to the conglomeration of pollution. The term pollution may be defined as contamination of the environment in such a way that it creates hazards or potential hazards to health and wellbeing of living and non-living. Since the expression "Pollution" is not defined legally, therefore a working definition is accepted. According to the U.S. President's Science Advisory Commission, "Pollution is the unfavourable alteration of our surroundings, through direct or indirect effects of changes in energy patterns, radiation levels, chemical and physical constitution and abundances of organisms."

ENVIRONMENTAL HAZARDSAND ITS IMPACT

In the name of progress or growth of industries, the business community has encouraged the coming up of the various industries using all sorts of chemicals mainly causing health problems to the human society. For instance, the pesticides used in agriculture something go into food chain or in water bodies and as such results in harmful health hazards. God (if there is one) in all His generosity of mind and liberality of sentiment has created a world and the people perfect, clear, healthy and beneficial. But how man has repaid the God or nature. At the initial

level, we have started questioning the existence of God and we have successfully destroyed every creation of god namely, the clear blue sky, the green earth, laughing and rippling water, fascinating flowers, extremely beautiful forms of Nature and we have called it the progress of human society. If any sensitive person raises any question about the health hazards that the science has brought in, the Government responds by various legislations, rules and regulations, guidelines and claims that these laws and rules would control and protect the health of the people. In this context, it should be emphasised here that every State in India is responsible for assuring and guaranteeing hygienic atmosphere and provide healthy environment for its citizens. Indiscriminate permissions to start polluting industries, not maintaining properly the sewerage system, disposal of solid waste, lack of facilities for storing the rain waters, disposal of waste and effluent, improper maintenance of rural lanes, bye-lanes and thickly populated urban areas are main reasons for creating health problem among the people.

LEGAL REGULATIONS IN REGARD TO ENVIRONMENTAL HAZARDS

All over the world concern has been shown to combat ever-growing menace of environmental hazards and the need to protect human health. The important objective of the environmental law is to take appropriate steps for the protection and improvement of both natural and human environment. It also aims to prevent any environmental hazards to human being, other living creatures, plants and property. Due to the decline in the environmental quality, an increase in pollution, loss of vegetal cover and biological diversity, excessive concentration of harmful chemicals in the ambient atmosphere and in the food chain. Thus, there is a growing risk of environmental degradation and accidents, and threats to all the life support system. The existing legislations relating to environmental hazards are not adequate, especially on new chemicals.

CONCLUSION

It is advised that the civic problems must be given much importance by forming groups in every locality with the citizens in the locality as members of group and suggest to the authorities the ways and reasons of keeping the city, street and State free from any kind of health hazardous and create awareness among the people that they should also involve themselves in these important social activity. To make their living free from health hazards and create a peaceful atmosphere and thereby making our living peaceful and pleasurable and not painful and dreary. The Government must take it as its onerous responsibility by plucking into action rather than suggesting and taking without any practicable applicability. The people pay property tax, corporation tax and so many other related taxes. Yet no action is being taken particularly in the tackling mosquito menace, unhygienic water, keeping the city clean free from misuse of any park by disgraceand anti-social elements. One can see every day that most of the parks are not properly maintained and some of these parks have become den for anti-social elements like drunkards, gamblers etc. Serious steps should be taken, we cannot depend only on the law and State. People must come forward to help the Government. Let us unite to make our lives safe and peaceful by keeping our streets clean, atmosphere unpolluted so that health hazards can completely be prevented.

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32. IMPACT OF AIR POLLUTION AMONG LABOURS IN CHIDAMBARAM BLOCK

Dr.S.INDRADEVI, Assistant Professor, Dept. of Economics, DGGA College for Women, Mayiladuthurai.

ABSTRACT

Air pollution stems gases and air borne particles which, in excess, are harmful to human health, buildings and ecosystems. Air pollution in developing countries is derived not only from stack emission of pollutants from relatively large industries, where inadequate pollution control measures exist and pollutants are allowed to escape to atmosphere. The kind of air pollution emitted vary from industry vary from industry to another, the concentrations of different pollutants in the atmosphere also vary widely from process to process, and from place to place with different geographic and climatic conditions.. In general, the workplace exposure levels are much higher than that the general population, because the emissions are rapidly diluted and dispersed by the wind. But the exposure duration of the general population is much longer than that of workers. Air pollution is the presence of substances in air in sufficient concentration and for sufficient time, so as to be, or threaten to be injurious to human, plant or animal life, or to property, or which reasonably interferes with the comfortable enjoyment of life and property. Air pollutants arise from both manmade and natural processes. Air pollutants arise from both manmade and natural processes. Air pollution has been considered as the one of types of pollution which causes different disease in various labourers in Chidambaram Block and this leads to increase the expenditure of sample respondents on their health care. In this context the researcher taken this title.

INTRODUCTION

The term "air pollution" is used to describe substances that are artificially introduced into the air. Air pollution stems gases and air borne particles which, in excess, are harmful to human health, buildings and ecosystems. Air pollution in developing countries is derived not only from stack emission of pollutants from relatively large industries, like iron and steel, non-ferrous metals and petroleum products industries, but also from fugitive emission of pollutants from small scale factories, such as cement mills, lead refineries, chemical fertilizer and pesticide factories and so on, where inadequate pollution control measures exist and pollutants are allowed to escape to atmosphere. Since industrial activities always involve energy generation, the combustion of fuels is a main source of air pollution in developing countries, where coal is widely used not only for industrial, but also for domestic consumption. For instance in china, more than 70 per cent of total energy consumption relies on direct coal combustion, from which large amounts of pollutants (Suspended particulates, Sulphur dioxide, etc) are emitted under incomplete combustion and inadequate emission controls.

STATEMENT OF THE PROBLEM

The kind of air pollution emitted vary from industry vary from industry to another, the concentrations of different pollutants in the atmosphere also vary widely from process to process, and from place to place with different geographic and climatic conditions. It is difficult to estimate specific exposure levels of various pollutants from different industries to the general population in developing countries, as elsewhere. In general, the workplace exposure levels are much higher than that the general population, because the emissions are rapidly diluted and dispersed by the wind. But the exposure duration of the general population is much longer than that of workers.

AIR POLLUTION AND HUMAN HEALTH

Air pollution occurs when suspending particular matter and noxious gases occur in the the air .Smoke, ash and dust are major constituents of (Spm) sulphur and nitrogen based compound (S02,N02) and carbon monoxide, carbon dioxide is the main constituent of noxious fumes in the air. Among industrial activities thermal power stations top list of air polluters due to the high amount of discharge of smokes and ash .Chemical and fertilizer plants are also responsible for letting noxious substances in air during production. Air pollution in India is serious issue with major sources being fuel wood and biomass burning, fuel adulteration, vehicle emissions and traffic congestion.

NEED FOR THE STUDY

Air pollution is the presence of substances in air in sufficient concentration and for sufficient time, so as to be, or threaten to be injurious to human, plant or animal life, or to property, or which reasonably interferes with the comfortable enjoyment of life and property. Air pollutants arise from both manmade and natural processes. Air pollutants arise from both manmade and natural processes. Pollutants are also defined as primary pollutants resulting from combustion of fuels and industrial operations and secondary pollutants, those

which are produced due to reaction of primary pollutants in the atmosphere. The ambient air quality may be defined by the concentration of a set of pollutants which may be present in the ambient air we breathe in. These pollutants may be called criteria pollutants. Emission standards express the allowable concentrations of a contaminant at the point of discharge before any mixing with the surrounding air.

SOURCE OF AIR POLLUTION

Air pollution enter into the atmosphere by various natural and man-made activities Such as dust storm, volcanic eruptions, industrial pollution etc. They may be present in any form viz. solid, liquid and gas. Based on the mode of generation of pollutants, the sources are classified as (i) Natural sources pollution are forest fires, volcanic eruptions, dust storms and pollen grains (ii) Man-made sources are domestic, industrial, vehicular pollutions.

Based on the origin of pollutants are classified as (i) Primary pollutants, and (ii) Secondary pollutants. Tthe chemical composition of pollutants. They are classified as (i) Organic and (ii) Inorganic pollutants.

EFFECTS OF AIR POLLUTION ON HUMAN BEINGS

Air pollution has many effects on health of persons of all categories particles including nitrates, sulphates, carbon and acid aerosols are complex group of pollutions. Airborne particles vary in size and composition depending on time and location. Adults exposed to low levels of pollution will experience symptoms such as coughing, soreness in their chests, sore throats and sometimes headaches.

Effects of Air Pollution on Plants

The response of plants to air pollutants is variable and depends on the individual genotype, age, stage of growth, proximity and concentration of pollutants and duration of them on the slaught. It affects the opening of stomata photosynthesis, water relations, respiration and enzyme system.

EFFECTS OF AIR POLLUTION ON ANIMALS

The effects of air pollution on domestic animals are similar to those observed in humans. Chronic poisoning results from the ingestion of forage contaminated with atmosphere pollutants. Among the metallic contaminants, arsenic, lead and molybdenum are important. When the forage crops contaminated by fluoride containing materials are eaten continuously in live stocks symptoms of fluorisis appear.

EFFECTS OF AIR POLLUTION ON MATERIALS

Air pollution also causes damage to property and materials. The pollutants most destructive to materials are smoke, girt, and dust and Oxide of sulphur; oxide of sulphur causes erosion of building materials such as limestone, marble, mortar and deterioration of statues. Nitrous and Nitric acids formed by the activity of Nitrogen oxides. Precipitate down in the form of acid rains or may remain i the atmosphere in clouds and fogs. Acid rains have an erosive action on metal surfaces and caused fading of textiles and deterioration of fabrics. It also corrodes building, monuments, bridges, railings, etc. H2S decolorizes silver and lead paints. Ozone damages textiles discolours dyes and accelerates dyes as whereas rubber cracking

AIR POLLUTION PREVENTION

Solution efforts on pollution are always a big problem. This is why prevention interventions are always a better way of controlling air pollution. These prevention methods can be either come from government (laws) or by individual actions.

Government actions

→ Governments throughout the world have already taken action against air pollution by introducing green energy. Some government are investing in wind energy and solar energy, as well as other renewable energy, to minimise burning of fossil fuels which cause heavy air pollution

→ Governments also are forcing companies to be more responsible with their manufacturing activities, so that even though they still cause pollution, they are a lot controlled.

→ Companies also building more energy efficient cars which pollute less than before.

Individual Actions

→ Encourage your family to use the bus, train or bike when commuting. If we all do this, they will be fewer cars on road and less fumes.

→ Use energy (light, water, boiler, kettle and fire woods) wisely. This is because lots of fossil fuels are burned to generate electricity, and so if we can cut down the use; we will also cut down the amount of pollution we create.

→ Recycle and re-use things. This will minimise the dependence of producing new things. Remember manufacturing industries create a lot of pollution, so if we can re-use things like shopping plastic bags clothing, paper and bottles it can help.

OBJECTIVES OF THE STUDY

1.To study the expenditure pattern of Labourers on their health care due to air pollution

2.To examine the impact of air pollution of the study population.

3.To study the awareness of labours to control on air pollution

4.To suggest some policy measures to control air pollution in the labours.

RESEARCH METHODOLOGY

The present study is carried out in Chidambaram Town. The study uses the primary data collection

from various labourers (120) such as street vendors, scavengers, stall worker, are selected and stratified random sample method were adopted to identify the sample population. A well structured questionnaire is used to collect the primary data relating to impact of air pollution on human health.

TECHNIQUES

The researcher has used the following techniques in his study:

→ Documentation, Questionnaires, Interviews, Sampling

Table- 1

Classification of the Sample Respondents Affecting Air Pollution

Diseases affected by the Air Pollution	Total (n=120)	Percentage
Cold	58	48.3
Respiratory problem	40	33.3
Bronchitis	36	30.0
Asthma	60	50.0
Emphysema	72	60.0
Skin disease	83	69.2
Lung or throat cancer	48	40.0
Cold and skin	73	60.8

Source: computed from the primary data

Table – 1 shows that the classification of respondents affected by disease due to air pollution: Out of 120 respondents highly affected by the skin disease (69.2%), followed by cold and skin (60.8%), emphysema (60.0%) whereas other diseases affected between 36 per cent to 60 per cent for bronchitis, respiratory problem, lung or throat cancer, cold, and asthma respectively.

Table – 2 shows Monthly average expenditure on health care of respondents. The expenditure on Physician the Means Rs. 157, the maximum is Rs. 500 and the minimum is 0, this is on the side of male whereas on the female side the mean is Rs 302, the maximum is Rs. 1500 and the minimum is 0. The expenditure on Medicine, the mean is Rs. 397, the maximum is Rs. 3000 and the minimum is 0 on the side of male and on the side of female the mean is Rs. 408, the maximum is Rs. 1000 and the minimum is 0. The expenditure of respondents on Travel, the mean is Rs.547, the maximum is Rs. 4000 and the minimum is 0, this is on the side of male and on the side of female the mean is Rs. 413, the maximum is Rs. 2000 and The minimum is 0.

Table -2 Cost of Health Care

Cost of Health Care	Male	Female
Physician		
Maximum	500	1500
Mean	157	302
Medicine		
Maximum	2000	1000
Mean	397	408
Minimum	0	100
Diagnostic		
Maximum	3000	500
Mean	232	94
Travel		
Maximum	4000	2000
Mean	547	413

Source: Computed from the primary data

Table-3 ***Knowledge about Air Pollution-wise Classification of the Sample Respondents***

Knowledge about Air Pollution	Gender		Total	%
	Male	Female		
Much high	24	16	40	33.3
Somewhat high	18	12	30	25.0
Somewhat less	23	27	32	26.7
Much less	-	-	-	0.0
Total	65	55	120	100.0

Source: computed from the primary data

The above Table – 3 shows that 33.3 per cent respondents their knowledge is very high, 25.0 per cent Respondents their knowledge is somewhat high, 26.7 per cent Respondents the knowledge is somewhat less.

The above Table – 4 shows how the respondents gave the ranking on the source of air pollution. Out of 60 male 48 respondents and out of 60 female 45 respondents give the first rank for the sources of pollution is natural impact followed by second rank is tobacco smoking, third rank is motor vehicles, fourth rank is source of incomplete combustion of coal and wood and finally give the fifth rank is occurrence ash and dust in the study area.

Table- 4
Sources of Air Pollution-wise Ranking from the Sample Respondents

Source of Air Pollution	Male					Total	Female					Total
	Ranks						Ranks					
	1	2	3	4	5		1	2	3	4	5	
Motor vehicles	0	10	12	22	16	60	0	16	10	24	10	60
Occurrence ash and dust	6	16	12	16	10	60	0	20	17	14	9	60
Natural Impact	48	8	4	0	0	60	45	9	3	3	0	60
Source of incomplete combustion of coal and wood	6	12	20	16	6	60	9	7	18	10	16	60
Tobacco smoking	0	14	12	6	28	60	6	8	12	9	25	60
Source: computed from the primary data												

CONCLUSION

Air pollution has been considered as the one of types of pollution which causes different disease in various labourers in Chidambaram Block and this leads to increase the expenditure of sample respondents on their health care. As shown by the study the most source of air pollution is motor vehicles and the most of them are affected by skin diseases in the study area.

Suggestions

→ The Municipality should increase the health facilities to the labourers in order to take care of them.

→ The state government should advise the company holders to pollute less through the awareness programmes and issue the materials..

→ The Local authorities should make the control of old vehicle because those vehicles are more contributed to air pollution.

→ The government should encourage people to use solar energy in their electronics goods.

→ The government should increase the number of project against air pollution.

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33. TO DETERMINE THE ACUTE TOXICITY PESTICIDE OF MALATHION AND METABOLIC ACTIVITIES AND RESPIRATORY RESPONSES IN FRESHWATER FISH LABEO ROHITA.

S.NAZERATH NISHA, Ph.D., Research Scholar, P.G and Research and Department of Zoology, V.O.Chidambaram College, Thoothukudi,628008.

B. GEETHA, Associate professor, P.G and Research and Department of Zoology, V.O.Chidambaram College, Thoothukudi,628008, Tamil Nadu,India.

ABSTRACT

The water pollution of aquatic environment with wide array of pesticides has become a menace to the aquatic flora and fauna. The organophosphorus pesticide malathion has been widely used in agriculture for several crops such as paddy, cotton and vegetables to control serious insects and mites. These chemicals cause severe damage to aquatic ecosystem especially to fishes. The main aim and objective of present study is to evaluate the impact on protein and glycogen in fingerlings of Labeo rohita an economically important Indian major carp. The 96 hrs LC50 value of malathion for L.rohita was 9.0 ml/L. No mortality was observed below the concentration of 7.5 ml/L. The changes in biochemical parameters such as protein and glycogen are important to indicate the susceptibility of organs system to pollutants by altering their function. In the present investigation the protein and glycogen contents of muscles, gills, liver, kidney and brain of L.rohita were analysed. Fish reared in control group registered high protein and glycogen contents when compared with malathion treated groups during 24, 48, 72 and 96 hrs respectively. The similar results were obtained in the oxygen consumption of L.rohita during 24, 48, 72 and 96 hrs respectively It is concluded that malathion concentrations (low and high) is very toxic and causes alterations in vital organs of fish L. rohita.

KEYWORDS : water pollution, pesticides, fish,

INTRODUCTION

The pollution of rivers and streams are caused mainly due to chemical contaminant. It has become one of the most critical environmental problems. The industrial and agricultural problems throughout the world in general and in India due to alarming rise in human population. It also caused tremendous environmental contamination. The aquatic environment is affected by various types of toxicants. Particularly pesticides used in agriculture are one of the major sources of water pollution. The widespread use of pesticides not only brought adverse influence on agro-ecosystems but also caused alternation in physiological processes of non-target organisms. In many countries large-scale mortality of fishes has been recorded due to pesticides in water bodies as pollutants. The toxicity study is essential to find out limit and safe concentration of toxicants. Malathion is a non-systemic wide spectrum organophosphate insecticide. It was one of the organophosphate insecticides developed in 1950. Malathion is used for agricultural and non-agricultural purposes. One of the main factors causing pollution of the environment is irrational use of organophophorous insecticides (A1-Haj et al., 2005). It is a major source of environment poisoning in developing countries (WHO,2003). Among the organophophorous pesticides malathion is considered relatively safe for use in mammals. However, impurities in commercial formulations are potent inhibitors of carboxylesterases , allowing dramatic increase in malathion formation (Buratti et al., 2005). The present work has been carried out to study the lethal concentration of 50% (LC50) of pesticides, preferably malathion on the fresh water fish L. rohita.

MATERIALS AND METHODS

FISH ACCLIMATIZATION

Almost equal sized fish L. rohita were brought from the local fish farm, Tirunelveli district of Tamil Nadu, India, and immediately transported to laboratory. These fishes were observed for nay pathological symptoms and then placed in 0.1% potassium permanganate (KMnO4) for two minutes so as to avoid any dermal infection. Then fishes were washed with water and acclimatized to laboratory conditions for three weeks during which they were regularly fed with dried pellets of 20% protein diet. The water used was clear and unchlorinated. Salinity, temperature, pH, dissolved oxygen content and water hardness of water were averaged to 0.25±0.1 ppt, 22.5±0.5˚C, 7.9±0.1, 4.71±0.15ml-1 and 179±5.10 mgCaCO3l-1, respectively.

Active and healthy L.rohita (2.97g:5cm) were chosen from acclimation tank, food supply was withdrawn 25 hrs prior to experimentation. A commercial grade of pesticide malathion (50% emulsified concentration, EC) was used for bioassay test. An acute toxicity (LC50) test by static renewal bioassay method was conducted to determine the toxicity of malathion in the L.rohita which was exposed to various concentration of malathion for 96 hrs and the pesticide was procured from the local market at Tuticorin, Tamil Nadu, India. The required quantity of malathion was drawn directly from this emulsified concentration using a variable micropipette.

For LC50 calculation, active fish (2.97±1.50g) were chosen and sorted out into seven groups each consisting of 10 fishes. Test animals were exposed (in circular plastic trough of 25l capacity) to 0, of malathion, mortality was recorded for every 24 hrs and dead fishes were removed when observed, every time noting the number of fish deaths at each concentration up to 96 hrs .Triplicates were maintained simultaneously. The LC50 were determined / estimated with 95% confidence limit for malathion for 96 hrs by probit analysis (FINNEY, 1971). The concentration at which 50% survival / mortality occurred in malathion treated fishes was taken as the median lethal concentration (LC50) for 96 hrs which was 9.0 ml/L. One tenth of the LC50 value (9.0 ml/L) was taken for the sub lethal studies according to S Prague (1973).

RESULTS:

The 96 hrs LC50 value of malathion for L.rohita was 9.0 ml/L. No mortality was observed below the concentration of 7.5 ml/L. However the concentration of 7.5ml/L and above were observed to be toxic. The upper and lower 95% confidence limits were found to be 1.96 and 1.92, respectively. The ***value of slope was 1.12. (Table 1).***

Table 1: Effect of malathion concentrations on per cent mortality in Labeo rohita exposed for 96 hr. Lethal concentration, slope function and 95% confidence limits are expressed in (µl/L)

Concentration of malathion	*Dead / tested*	*Mortality(%)*	*Lethal concentration(µl/L) Slope function(S) 95% confidence limit*			*Slope function(S)*	*95% confidence limit*	
			16%	50%	84%		Lower	Upper
7.5	1/10	10						
8.0	2/10	20						
8.5	3/10	30						
9.0	5/10	50				1.12		
9.5	7/10	70	7.8	9.0	9.8		1.92	1.96
10.0	10/10	100						

Table 2: Glycogen content in various tissues of Labeo rohita exposed sublethal concentrations of malathion.

Tissue	**Control**	**Experimental Periods**			
		24	**48**	**72**	**96**
Muscles	1.35± 0.21	1.10± 0.01	0.90± 0.06	0.43± 0.09	0.21± 0.87
Gills	0.4±00.32	0.33±0.08	0.29±0.12	0.21± 0.006	0.09±0.48
Liver	0.63±0.19	0.55±0.32	0.43±0.02	0.31±0.12	0.16±0.09
Kidney	0.60±0.14	0.54±1.04	0.43±0.009	0.31±0.23	0.19±0.11
Brain	1.02±0.42	0.98±0.54	0.76±0.06	0.45±1.07	0.28±0.10

Table 3 : Oxygen consumption Labeo rohita exposed sublethal concentrations of malathion

Rate of oxygen consumption (mg 2 g-1 hr-1)	**Experimental Periods**				
	Control	24	48	72	96
	0.20±0.02	0.29±0.22	0.47±0.05	0.53±0.04	0.71±0.06

The biochemical changes in both protein and glycogen against to the pesticides of malathion in experimental fish L.rohita were provided (Table 2). The changes in the biochemical constituents in the of the L.rohita exposed to malathion at different exposure were observed in the present study. The proteins contents were found to be significantly reduced in different tissues of malathion exposed fish. Similarly the results obtained showed that glycogen contents were found to be significantly reduced in different tissues of malathion exposed L.rohita, it indicates may be excess pollution which induced toxicity. In the present investigation fish reared in control group registered high protein and glycogen contents when compared with malathion treated groups. The similar results were obtained in the oxygen consumption of L.rohita during 24, 48, 72 and 96 hrs respectively(Table 3).

DISCUSSION

During behavioural manifestation, the L.rohita showed normal behavior such as well-coordinated with active movements, static equilibrium, active swimming, normal gill movement, free gulping of air at the surface water, horizontal hanging in the water with natural body color and zero mortality were observed in control group. But in the toxic environment fishes exhibited irregular, fishes frequently coming to the surface of water, loss of equilibrium, erratic and darting swimming movements, vertical hanging, increased opercular movements, rapid gill movement, fading of their body color and excess mucus secretion all over body and restlessness. Finally the fish sank to the bottom with their least opercular movement and died with their mouth open.

In the present study during acute toxicity test, the fishes exhibited several abnormal behavioural responses such as erratic and darting swimming movements and loss of equilibrium. They slowly become lethargic, hyperexcited, restless and secreted excess mucus all over their bodies. Opercular movements increased initially in all exposure periods but decreased later steadily in the sub lethal exposure periods. Borah and Yadav (1995) observed that, opercular movements are increased.loss of equilibrium, erratic swimming and jerky movement and mucous secretion all over the body were in Heteropneustes fossils after exposure to rigor and endosulfan pesticides. Santhakuamr and Balaji (2000) also observed this phenomenon in Anabas test studies after exposure to monocrotophos. Fishes are the excellent models for monitoring environmental contamination in aquatic system. Many authors investigated that pesticide toxicity induced respiratory distress in fishes. Natarajan (1981) found reduction in oxygen consumption in Channa punctatus exposed to organophosphate pesticide. Similarly Boradbury et al., (1986) stated that the rate of oxygen consumption decreased in Cirrhinus mrigal may be due to internal action of pesticide. Variation in oxygen consumption is an indicator of stress, which is frequently used to evaluate the changes in metabolism under environmental deterioration. Similarly Khillare and Wagh (1987) also found that rate of oxygen consumption reduced in the fish Barbus stigma when exposed to malathion and nuvan. In addition to Verma and Dalela (1975) observed that reduction of oxygen consumption of fish might be due to perched solids present in the effluents which cause mechanical injuries to fish and disturb the osmotic regulation. And also several authors reported that the disturbance in oxidative metabolism leads alternation in whole oxygen consumption in different species of fish exposed to pesticides.

CONCLUSION

In conclusion, the present work indicates that Malathion causes considerable changes in the intermediary metabolism of the fish L.rohita. The cause for these alterations appears to be the result of high energy demands in order to survive from the stressful condition from the toxicants. Hence it may leads to decrease the glycogen and protein from various tissues of the test fish.

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34. A PANORAMIC VIEW ON RURAL ENERGY CONSUMPTION

M. MANIMEGALAI, Ph.D Research Scholar, Bishop Heber College (Autonomous), Trichy-17.
Dr. S. SEETHALAKSHMI, Assistant Professor, Bishop Heber College (Autonomous), Trichy-17.

ABSTRACT

Energy consumption is an index of economic development energy is essential to ensure adequate and sustained supply for energy sector of the economy. The rural energy consumption pattern is divided into agricultural operation domestic activities, living and industry. Rural energy consumption influences the standard of living of the people in rural areas. India is the largest energy consumer in the world. In India, out of 121crs of populations, 80crs of people living rural areas and affordability are vitally our country keep its pace of development.

INTRODUCTION

The Indian economy is growing steadily and every Indian is proud of that. This is because of the most important resources required to maintain or accelerate this growth in energy. Now a days energy is the very basic needs of life, insufficiency of energy will bring economic stagnation by lowering optimum productivity. The world's population has now exceeded 6 billion people. More than half of the world's population lives in rural areas and vast majority of these, some 2.8 billion people countries. There are rural areas in developing countries. There people without access to adequate, affordable and convenient sources.

Lack of access of affordable energy is an important factor contributing to the relatively poor quality of life in rural areas of developing countries. The potential market of are the rural poor are characterized by a high demand for purposes such as lighting, cooking, space heating in the domestic sector; water lifting and transportation in agriculture; and small medium enterprises.

ENERGY CONSUMPTION - INDIAN SCENARIO

The energy sector holds the key in accelerating the economic growth of India. But the development of Indian energy sector has seen constrained by capital, technology, environment and security issues. Future economic growth crucially depends on the long term availability of sources that are affordable, accessible and environment friendly. India ranks sixth in the world in total energy consumption, accounts for global energy consumption. India is rich in coal and renewable energy sources (solar, wind, hydro and bio-energy sources) but it has very less hydrocarbon reserve (0.4% of world's reserve). India is a net importer of energy. More than 25% of primary energy needs is met through imports mainly in form of crude oil and natural gas. Heavy dependence on non renewable sources of energy like coal, petroleum, natural gas is to meet the demand. During the pre reform period, the commercial energy sector was totally regulated by the government. The economic reform and liberalization, in post 90's, has opened the doors for private sector participation in coal, oil, gas and electricity sector.

PATTERN OF ENERGY CONSUMPTION IN RURAL AREAS

There are three main ways to consume energy in rural areas are follows:

1. Domestic Consumption
- Cooking
- Lightening
2. Industrial consumption
- Micro small and medium enterprises
- Big industry
3. Agricultural consumption

SOURCES OF ENERGY IN RURAL INDIA

1. **Firewood**

Firewood gathered from forested commons is an important source of domestic energy in rural areas of many poor counties. It has been estimated that more than 2.4 billion people rely directly on traditional biomass fuels for their cooking and heating, and in poor countries biomass use represents over half of residential energy consumption.

2. Electricity

Electricity the flow of electrical power is a secondary energy source generated by the conversion of primary sources of energy like fossil, nuclear, wind or solar.

3. LPG

LPG is used worldwide cooking and heating, especially in areas without connection to piped natural gas. It is a clan fuel. The largest rural energy access survey of India which was conducted last year by the council on Energy, Environment and Water(CEEW) and the Department of Political Science at Columbia University, shows that as many as 95 per cent of LPG deprived households cite their inability to pay as a barrier to their adopting LPG. Thus, the scheme is well targeted to pay as a barrier

to their adopting LPG. Thus, the scheme is well targeted to pay as a barrier to their adopting high upfront cost, which has limited the transition towards LPG use in poorer households. while the move is appreciable, other challenges that limit the use of this clean in India must be resolved simultaneously.

4. Kerosene

Kerosene, a liquid, does not as a consequence burn as cleanly as gaseous fuels. it nonetheless is considerably cleaner than the biomass used in traditional stoves. One of kerosene's main advantages is that it is far easier to transport and distribute than gaseous fuels and, unlike LPG, can purchased in any quantity. For households with cash constrains, are more expensive than wood stoves.

NEED FOR RURAL ENERGY POLICY

India is the most populous in the world and has extreme ecological diversity. 70 per cent of the population in India, close to700 million, still lives in the rural areas. Meeting their energy requirements in a sustainable manner continues to be a major challenge for the country. All most 75 per cent of the total rural energy consumption is in domestic sector. For meeting their cooking energy requirements, villagers depend predominantly on biomass fuels like wood, animal dung and agricultural residues, often burnt inefficient traditional cook stoves. The main fuel for lighting in the rural households is kerosene and electricity. Irrigation is mainly thorough electrical and diesel pump sets, while the industries and the transport sectors rely primarily on animal to some extent on commercial sources of energy like diesel and electricity.

RURAL ENERGY PROGRAMMES

1.National Programme on improved Chulhas
2.National project on biogas development
3.Community, institutional and Night Soil based biogas Programme
4.Rural Energy entrepreneurship and institutional Development(REEID)
5.Women and Renewable Energy Development (WRED)
6.Biomass Production, conversion and utilisation Programme
7.Biomass gasification Programme
8.Animal Energy Programme
9.Integrated Rural energy Programme

CURRENT ENERGY PROGRAMMES

1.National biogas and manure management Programme
2.Solar thermal applications in rural areas
3.Solar Photovoltaic Programme for rural areas
4.Biomass Gasified Programme for power Generation for meeting unmet demand in electrified villages
5.Biogas based distributed power generation programme
6.Village Energy Security Programme
7.Remote village Electrified Programme
8.Fuel Wood Programme

RURAL ENERGY DEVELOPMENT IN INDIA

Rural Development purse has never figured in the stated Energy Policy. Rural electrification is mainly perceived in the context of energy requirements to meet the irrigation needs of agriculture as part of the overall food security policy. Therefore, rural irrigation PRIORITY was to provide assistance for transmitting energy to agricultural pump sets to increase the productivity of land. House electrification came as a secondary or incidental issue. The whole definition of rural energy in the past was to provide on connection to a village which was primarily used to electrify agricultural pump sets. The Government of India changed the definition of village electrification recently to state that a village is considered as electrified if it provides electrification recently to state that village is considered as electrified if it provides electricity/ power to all the habitations in the village. They consider the village as electrified if at least 10 to 20 percent of the inhabitants in the villages are provided with energy for lighting.

STRATEGIES AND TECHNOLOGIES USED IN RURAL AREAS

The Fourth Industrial Revolution heralds an exponential pace of technological change, build on the digital revolution to combine technologies, spawn new ones, and transform systems, industries, countries-even society itself. For developing countries, advances in computing power, connectivity, artificial intelligence, biotechnology and GIS, and newer, more capable technologies hold tremendous promise.

Inclusive agriculture, rural growth and structural transformation from agriculture to high-productivity manufacturing and other economic sectors can be accelerated, as technological change transforms individuals' lives and enables developing countries to progress at speeds and on scales previously inconceivable. To realize the positive outcomes of this new industrial revolution, public policymaking must bridge the already widening gap between skilled and unskilled labour. The case of India is salient because, unlike its East and Southeast Asian neighbors', rabid economic growth has not been inclusive enough to reduce the numbers of Indians living in poverty. India contains the largest number of poor people in the world(270 million) according to the World Bank.

The Government of India is confronting these challenges. As more young men are migrating

from rural poverty to urban areas to seek employment, they are contributing to a rapid feminization of agriculture. In 2016 India's Prime Minister Narendra Modi introduced a new national policy to double farmers' incomes by 2022. It targeted poverty reduction, food security reduction and climate change. It is hurting agriculture with rising temperatures, increasingly frequent floods and droughts, and a greater incidence of pests and

CHARACTERISTICS OF ENERGY IN RURAL INDIA

- Energy can be stored
- Energy can be transferred
- Energy can be transported
- Energy can be preserved
- Energy can be transformed
- Energy can be degraded

ENERGY AND SUSTAINABLE DEVELOPMENT

Energy economists have opined that energy consumption is an index of economic development. In overall economic development of a nation, energy is essential to ensure adequate and sustained supply for the economy. Efficient infrastructure is a pre-requisite for mobilizing economic development. Modern economists such as Schurr, Baly and Jorgen stated that energy is the fifth factor of production in addition to land, labour, capital and organization. Suggestion

- Government should talk steps to introduce solar energy system in rural areas.
- Energy awareness should be created among the rural people.
- Subsidies should be given to use bio-mass and bio gas energy.

CONCLUSION

In this modern world energy is an important source for Agriculture, Industry and Service sector. And also it will improve the standard of living of the people. Rural energy consumption in India increasing year by year. At the same time, the energy from non- renewable sources showing a declining trend. To rise the quality of life of the people in rural areas and to protect the future generation, consumption of renewable sources of energy should be increased creation of energy from solar, wind, hydro and bio-mass energy will be motivated.

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35. ENVIRONMENTAL ACCOUNTING AND MANAGEMENT

Dr. C.SIVAKKOLUNDU, Assistant Professor, Department of Economics, Thiruvalluvar University, Serkkadu, Vellore, Tamil Nadu – 632 115.

INTRODUCTION

There is a worldwide debate on the issue of environmental management, stemming from a flow of evidence about ecological degradation caused by economic development. Now, due to cost pressures, customer awareness, supply chain relations and activities of environmental campaigners encourage the companies to go for environmental initiatives. The society particularly from developed countries highly concern about the impacts on the quality of their life due to the pollution of air, land and water. To evaluate the applicability of the proposed five stages framework for Environmental Management System.

PROBLEMS OF ENVIRONMENTAL ACCOUNTING

In the context of environmental disclosure in company's annual report, it has been noticed and reported that there are:

- Lack of awareness and understanding on the nature and extent of the adoption of environmental management system practices and organization's environmental accounting function.
- Lack of understanding and commitment of companies for the needs in the environmental disclosure

OBJECTIVES OF ENVIRONMENTAL ACCOUNTING

- To determine and assess the effect of environmental accounting on the improvement of environmental and overall organization's performance.
- To determine the extent of environmental disclosure as a part of social responsibility.
- To determine the effectiveness of environmental cost accounting system for environmental audits and performance improvements.

FORMS OF BUSINESS ACTIVITY

This study focuses on the use of environmental accounting system to monitor the baseline parameters in the environmental management system as an effective tool to monitor and evaluate organization's commitment to environmentally sustainable forms of business activity.

ENVIRONMENTAL ACCOUNTING SYSTEM

As environmental management in business has evolved over time, interest has grown in developing a better understanding of environmental-related financial costs and benefits as input to conventional management accounting. The main stimulus is growing evidence that focus on environmental related factors can enhance the profitability and financial position of a business. Environmental accounting is used to assess full environmental costs associated with activities and/or products. Environmental performance of organizations' in more measurable manner. The key areas for monitoring are aggregated emission to air, water effluent discharge, soil contamination and boundary noise level.

A TOOL OF EVALUATE ENVIRONMENT

In the past, environmental accounting systems were used as a tool to evaluate and disclose environmental impact reduction effects to environmental conservation costs. However, in fact now the EMS in business has evolved, interest has grown in developing a better understanding of environmental related financial costs and benefits as an input to conventional management accounting. For example, the internal costs associated with air emission to the environment are often not identified within conventional management practices. As a result, cost savings relating to environmental pressures frequently remain hidden. So need to establish and adopt the environmental accounting.

DECISION MAKING PROCESS

Most companies had recognized the superiority in principle of pollution prevention at source over end-of-pipe solution, and were seeking to prevent pollution by integrating EMS into their complex environmental decision-making processes, which eventually lead to sustainable management. This tool to internally measure and evaluate the profit obtained from business activities It is necessary to measure and identify the environmental cost impact such as air emission, waste disposal, waste water. The organizations also need to measures and evaluates environmental conservation costs paid by product line and process, whether the costs work toward advancing social effects and corporate profits, and whether the environmental impact of business activities as a whole suits the organization's business size which leads to the establishment of a framework for environmental accounting.

LACK OF ENVIRONMENTAL AWARENESS

Sixty eight percent of companies surveyed claimed that their activities had no significant impact toward environment, and therefore there is no need for any disclosures. Further, many companies believed that environmental issues claimed that environmental impacts are unknown.

LACK OF PERCEIVED BENEFIT

A large number of non disclosing companies did not believe that investment in environmental initiative offered them either opportunity for cost saving or improved support from shareholders. Only half existing reporting companies indicating that disclosure would be regular practices in their annual report further underline this belief.

LACK OF GOVERNMENT PRESSURE

One of the most prominent factors that are able to drive companies for environmental disclosure is the government. The government enforcement for mandatory environmental reporting is very important. The government is ranked above the influence of business associations and was seen to be more important the resource or shareholders and investors pressure. Strong instruction and enforcement is needed to overcome resistance and perceptions that environmental reporting is an unnecessary cost burden.

ENVIRONMENTAL AUDIT

Environmental auditing is a generic term, which encompasses a wide range of management activities, including environmental compliance audit, environmental risk assessments, and environmental review (Rezaee and Elam, 2000). In ISO 14001, environmental audit defined as "the systematic, documented verification process of objectively obtaining and evaluating audit evidence to determine the reliability of an assertion with regards to environmental aspects of activities, events and conditions as to how they measure established criteria, and the communicating such result to the client" (cited in Taylor et al., 2001). According to Taylor et al. (2001), the best EMS auditor is the auditor with an accounting background. The total estimated damage caused to the natural environment in one day according to the Germany Federal Environmental Agency (Letmathe and Doost, 2000) is given by:

- The destruction of 55,000 hectares of tropical forest;
- The reduction of arable land by 20,000 hectares;
- The extinction of 100 to 200 species;
- Emission of 60 million tons of carbon dioxide into the atmosphere

PREVENTION STRATEGIES

- Design products, which generate less waste or emission during their life cycle.
- Technologies that uses less power and produce less waste which subsequently will decrease the expensive "end-of-the-pipe" clean-up operations (Banerjee, 2001)
- Substitute materials that can reduce waste or indirect effect
- Modify operating processes to reduce wastes
- Develop continual waste and energy minimizing program
- Develop method to reuse or recycle waste rather than sent for disposal (recovery). Us
- Conservation – minimize depletion of natural resources by establishing effective control measures or prevention measures
- Use the recycled material

LIMITATION OF RESEARCH

In past, many researchers have identified the difficulties or limitations in establishing good environmental accounting are; difficult in forecasting future environmental related cost, type of the likelihood action or effort need to be taken, and failure to see the benefit of environmental accounting to companies. The amount of resource allocation in term of manpower, money and others by organizations towards environmental initiatives needs further investigation. In the area of environmental auditing, the depth of audit conducted either by external or internal auditors in determining the relationship between EMS and the environmental accounting need for further research.

CONCLUSION

The relationship between the organization and the environment is receiving increasing attention. Currently, debate on global climatic change and biodiversity is becoming more commonplace in corporate world, together with concern over water, air and soil pollution. Although the sustainability of economical development is a shared responsibility of organization, government and consumers, but the organizations can play vital role in slowing down the environmental degradation. It is possible because an organization has financial resources, technological knowledge and institutional capability and long-term vision to find environmental solutions. Thus, the programs or activities for keeping pollution under control, zero waste or design for environment such as product life cycle analysis (LCA), total quality environmental management and others. In this way, the organization can lead to an improvement in overall environmental performance, customers' satisfaction and company performance.

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36. WATER POLLUTION IN INDIA: AN OVERVIEW

S.KAVITHA, Ph.D Research Scholar, Department of Economics, Thiruvalluvar University, Serkkadu, Vellore-632 115. E-mail: skavitha.ckk@gmail.com.

Dr.C.DHANDAPANI, Professor & Head, Department of Economics, Thiruvalluvar University, Serkkadu, Vellore-632 115.

ABSTRACT

Most ancient civilizations grew along the banks of rivers. Even today, millions of people all over the world live on the banks of rivers and depend on them for their survival. All of us have seen a river large or small either flowing through our town or somewhere else. Rivers are nothing more than surface water flowing down from a higher altitude to a lower altitude due to the pull of gravity. One river might have its source in a glacier another in a spring or a lake. Rivers carry dissolved minerals organic compounds, small grains of sand gravel and other material as they flow downstream. Rivers begin as small streams which grow wider as smaller streams and rivers join them along their course across the land. Eventually they flow into seas or oceans. Unfortunately most of the world's major rivers are heavily polluted. The pollution of environment is the gift of the Industrial revolution prior to this the agrarian cultures created significant environment deforestation and overgrazing. The Environmental degradation is a byproduct of modern civilization. Water Pollution is a major global problem which requires on going evaluation and revision of water resource policy at all levels. It has been suggested that water pollution is the leading worldwide cause of deaths and diseases and that it accounts for the deaths of more than 14,000 people daily. An estimated 580 people in India die of water pollution related illness every day.

INTRODUCTION

Water pollution is a major global problem which requires ongoing evaluation and revision of water resource policy at all levels. It has been suggested that water pollution is the leading worldwide cause of deaths and diseases and that it accounts for the deaths of more than 14,000 people daily. An estimated 580 people in India die of water pollution related illness every day. Water pollution is the contamination of water bodies such as rivers, lakes, oceans and groundwater. This occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds. Humans are the cause of most of the pollution in our water ways and polluted storm water is a major contributor to degradation of our water ways. When something is added to environment that makes it unclean or unsafe it is called pollution. Water pollution occurs when the water becomes over loaded with too much of one thing and the aquatic organisms cannot keep up with their cleaning responsibilities. Some organisms may die and others grow too fast. There are many types and sources of water pollution (such as sewage pollution) that can pollute surface water of ground water.

OBJECTIVES OF WATER POLLUTION

→ Distinguish between point and non point sources of pollution.
→ Identify the wages in which human waste water can cause water pollution.
→ Evaluate the different technologies that humans have developed for treating waste water.
→ Identify the major types of heavy metals and other substances that pose serious hazards to humans and the environment.
→ Discuss the impact of oil spills and how such spills can be remediated.
→ Identify contaminants that are non chemical pollutants.
→ Explain the connections among industrialization affluence and water pollution legislation.

METHODOLOGY

The study is mainly descriptive in nature. Secondary data are used for the purpose of the study. The data was collected from websites, various articles and journals.

TYPES OF WATER POLLUTION

Water pollution any physical or chemical change in water that adversely affects the health of humans and other organisms.

- Sewage
- Disease causing agents
- Sediment pollution
- Inorganic plant and algal nutrients
- Organic compounds
- Inorganic chemicals
- Radioactive substances and
- Thermal pollution

MAIN CAUSES OF WATER POLLUTION IN INDIA

Water pollution is caused due to several reasons. Here are the few major causes of water pollution.

1. Sewage and Waste Water

Sewage garbage and liquid waste of households, agricultural lands and factories are discharged into takes and rivers. These wastes contain harmful chemicals and toxins which make the water poisonous for aquatic animals and plants.

2. Dumping

Dumping of solid wastes and litters in water bodies causes huge problems. Litters include glass, plastic, aluminum, Styrofoam, etc., different things take different amount of time to degrade in water. They affect aquatic plants and animals.

3. Industrial Waste

Industrial waste contains pollutants like asbestos, lead, mercury and petro chemicals which are extremely harmful to both people and environment industrial waste is discharged into lakes and rivers by using fresh water making the water contaminated.

4. Oil Pollution

Sea water gets polluted due to oil spilled from ships and tankers while travelling. The spilled oil does not dissolve in water and forms a thick sludge polluting the water.

5. Acid Rain

Acid rain is pollution of water caused by air pollution. When the acidic particles caused by air pollution in the atmosphere mix with water vapor, it results in acid rain.

6. Global Warming

Due to global warming there is an increase in water temperature. This increase in temperature results in death of aquatic plants and animals. This also results in bleaching of coral reefs in water.

7. Eutrophication

Eutrophication is an increased level of nutrients in water bodies. This results in bloom of algae in water. It also depletes the oxygen in water, which negatively affects fish and other aquatic animal population.

TREATING POLLUTED WATER

It is very important to prevent the pollution of water bodies and remove existing contaminants or reducing the concentration of these contaminants so as to make it fit for desired use following are some of the ways of treating polluted water.

INDUSTRIAL TREATMENT

The raw sewage is needed to be treated correctly in a water treatment plant before it can be safely released into the environment to reduce the amount and toxin city of waste, it is passed through a number of chambers and chemical processes in water treatment plant.

GENTRIFICATION

Conversion of nitrates in gas is called Gentrification. It is an ecological approach to prevent locating of nitrates in soil. It stops ground water from getting contaminated.

OZONE WASTE WATER TREATMENT

Ozone waste water treatment method is becoming very popular in this method; the pollutants in water are broken done by an ozone generator. Ozone oxidizes bacteria, molds organic material and other pollutants in water.

SEPTIC TANKS

Septic tanks are used to treat sewage at the place of location instead of treating in any plant or sewage system. This system is used at the individual building level. The sewage is separated into solid and liquid components and treated separately.

EFFECTS OF WATER POLLUTION

The water pollution is very harmful to humans, animals and water life. The effects can be catastrophic depending on the kind of chemicals, concentrations of the pollutants and where there are polluted. The effects of water pollution are varied and depend on what chemicals are dumped and in which locations.

Many water bodies near urban areas cities and towns are highly polluted. This is the result of both garbage dumped by individuals and dangerous chemicals legally or illegally dumped by manufacturing industries, health centers, schools and market places.

DEATH OF WATER ANIMALS

The main problem caused by water pollution is that it kills organisms that depend on these water bodies. Dead fish, crabs, birds and sea gulls, dolphins and many other animals often wind up on beaches killed by pollutants in their habitat living environment.

DISRUPTION OF FOOD-CHIN

Pollution disrupts that natural food chain as well. Pollutants such as lead and cadmium are eaten by tiny animals. Later these animals are consumed by fish and shellfish and the food chain continues to be disrupted at all higher levels.

DISEASES

Eventually, humans are affected by this process as well. People can get diseases such as hepatitis by eating seafood that has been poisoned. In many poor nations, there is always outbreak of

cholera and diseases as a result of poor drinking water treatment from contaminated water.

DESTRUCTION OF ECOSYSTEMS

The interaction of living things in a place depending on each other for life can be severely changed or destroyed by water pollution. Many areas are now being affected by careless human pollution and this pollution is coming back to hurt humans in many ways.

SIGNS OF WATER POLLUTION

→ Bad taste of drinking water.
→ Offensive odors from Lakes Rivers and ocean beaches.
→ Unchecked growth of aquatic weeds in water bodies.
→ Decrease in number of fish in fresh water, river water, sea water.
→ Oil and grease floating on water surfaces.
→ These disturb the normal uses of water for public water supply.; Recreation and aesthetics, Fish other aquatic life and wild life, Agriculture, Industry.

PREVENTION OF WATER POLLUTION

→ Do not pour fat from cooking or any other type of fat, oil or grease down the sink. Keep a fat jar under the sink to collect the fat and discard in the solid waste when full.
→ Do not dispose of household chemicals or cleaning agents down the sink or toilet. Simsbury has a hazardous waste collection day usually from 8:00 am to 1:00 pm at Henry James school Connecticut resource recovery authority lists all collection dates.
→ Do not flush pills, liquid or powder medications or drugs down the toilet. For recommendations on proper disposal for all types of medical wastes.
→ Avoid using a garbage disposal keep solid wastes solid. Make a compost pile from vegetable scraps.
→ Install a water efficient toilet. In the meantime, put a brick or ½ gal container in the standard toilet tank to reduce water use per flush.
→ Run the dishwasher or clothes washer only when you have a full load. This conserves electricity and water.
→ Use the minimum amount of detergent and or bleach when you are washing clothes or dishes use only phosphate free soaps and detergents.
→ Minimize the use of pesticides, herbicides, fertilizers. Do not dispose of these chemicals, motor oil or other automotive fluids into the sanitary sewer or storm sewer systems. Both of them end at the river.
→ If you home has a sump pump or cellar drain make certain it does not drain into the sanitary sewer system.

CONCLUSION

Water pollution has the capabilities to disrupt life on our planet to a great extent. Congress has passed laws to try to combat water pollution thus acknowledging the fact that water pollution is indeed, a serious issue. But the government alone cannot solve the entire problem. We must become familiar with our local water resources and learn about ways for disposing harmful household wastes so they do not end up in sewage treatment plants that cannot handle them or landfills not designed to receive hazardous materials.

We must determine whether additional nutrients are needed before fertilizers are applied and look for alternatives where fertilizers might run off into surface waters. We have to preserve existing trees and plant new trees and shrubs to help prevent soil erosion and promote infiltration of water into the soil. Around our houses, we must keep litter, pet waste, leaves and grass clippings out of gutters and storm drains.

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37. IMPACTS OF URBANIZATION ON ENVIRONMENT

Dr. C. SIVAKKOLUNDU, Assistant Professor, Department of Economics, Thiruvalluvar University, Serkkadu, Vellore – 632 115.

SUJATHA, M. Phil., Research Scholar, Department of Economics, Thiruvalluvar University, Serkkadu, Vellore-632 115.

ABSTRACT

Urbanization refers to general increase in population and the amount of industrialization of a settlement. It includes increase in the number and extent of cities. It symbolizes the movement of people from rural to urban areas. Urbanization happens because of the increase in the extent and density of urban areas. Due to uncontrolled urbanization in India, environmental degradation has been occurring very rapidly and causing many problems like land insecurity, worsening water quality, excessive air pollution, noise and the problems of waste disposal. This paper emphasizes on the effect of urbanization on environmental components mainly climate, biosphere, land and water resources. A case study of urbanization in India and metropolitan cities have been carried out leading to conclude on the existing causes of damage to the environment due to urbanization and preventive measures to keep a check on them. Although it is impossible to restrict urbanization it has to be ensured that urbanization proceeds in the right path causing minimum impact on environment.

INTRODUCTION

Urbanization is a process that leads to the growth of cities due to industrialization and economic development, and that leads to urban- specific changes in specialization, labor division and human behaviors. The population is growing at the rate of about 17 million annually which means a staggering 45,000 births per day and 31 births per minutes. If the current trend continues, by the year 2050, India would have 1620 million populations. Due to uncontrolled urbanization in India, environmental degradation has been occurring very rapidly and causing many problems like shortages of housing, worsening water quality, excessive air pollution, noise, dust and heat, and the problems of disposal of solid wastes and hazardous wastes.

IMPACTS OF URBANIZATION

The most emerging issues are climate changes, freshwater scarcity, deforestation, and fresh water pollution and population growth. These problems are very complex and their interactions are hard to define. It is very important to examine problems trough the social-economic-cultural system.

IMPACTS ON THE ATMOSPHERE AND CLIMATE

The Creation of Heat Island

Materials like concrete, asphalt, bricks etc absorb and reflect energy differently than vegetation and soil. Cities remain warm in the night when the countryside has already cooled.

Changes in Air Quality

Human activities release a wide range of emissions into the environment including carbon dioxide, carbon monoxide, ozone, sulfur oxides, nitrogen oxides, lead, and many other pollutants.

POLLUTION

Pollutants are often dispersed across cities or concentrated in industrial areas or waste sites. Lead- based paint used on roads and highways and on buildings is one such example of a widely dispersed pollutant that found its way into soil.

IMPACTS ON THE HYDROSPHERE AND WATER RESOURCES

Flow of Water into Streams

Natural vegetation and undisturbed soil are replaced with concrete, asphalt, brick, and other impermeable surfaces. This means that, when it rains, water is less likely to be absorbed into the ground and, instead, flows directly into river channels.

Flow of Water through Streams

Higher, faster peak flows change streams channels that have evolved over centuries under natural conditions. Flooding can be a major problem as cities grow and stream channels attempt to keep up with these changes.

Degraded Water Quality

The water quality has degraded with time due to urbanization that ultimately leads to increased sedimentation there by also increasing the pollutant in run-off.

IMPACTS ON THE BIOSPHERE

Modification of Habitats

The fertilizers that spread across lawns find its way into water channels where it promotes the growth of plants at the expense of fish. The waste dumped into streams lowers oxygen levels during its decay and cause the die-off of plants and animals.

Destruction of Habitats

There is also complete eradication of habitats as

an outcome of urbanization and native species are pushed out of cities.

Creation of New Habitats

New habitats are also created for some native and non-native species. Cities also create habitats for some species considered pests, such as pigeons, sparrows, rats, mice, flies and mosquitoes. Urbanization has, for example, eliminated many bat colonies in caves, but has provided sites such as bridges for these species to nest.

GROWTH IN MOTOR VEHICLES IN INDIA AND IN METROPOLITAN CITIES

Within 10 years from 1990 to 2000 there has been almost a three-fold increase in the number motor vehicles in India. On an average 10% increase has been found in each year, which is a serious concern for air pollution.

THE ENVIRONMENTAL EFFECTS OF URBANIZATION

- The urban heat island has become a growing concern and is increasing over the years. The urban heat island is formed when industrial and urban areas are developed and heat becomes more abundant. In rural areas, a large part of the incoming solar energy is used to evaporate water from vegetation and soil.
- Global warming, air pollution, water scarcity and pollution and loss of forest cover, agricultural land and depletion of wildlife as a result of urban sprawl, pose serious threats to the environment.
- Urban areas suffer from serious problems of environmental pollution. There are high levels of air pollution and noise pollution due to industries and automobiles. Water is also polluted due to industrial wastewater discharge. Solid waste generation in urban areas is very high, and its proper disposal is a major problem.
- Proper sewerage facilities are often lacking in urban areas. In the crowded slums, the human waste is just deposited in gutters or vacant spaces, which become a breeding ground for pathogenic bacteria spreading salmonella and hepatitis infections. In most of the cities heavy rainfall totally upsets the sewerage system.
- Cities are warmer than villages. Due to lot of heat released by various types of human activities in cities, which get retained by built structures and then slowly released into the atmosphere there is creation of urban heat island. This problem can be partially tackled by growing green belts of trees.
- Urbanization also provides several benefits when there is a well-planned city with proper transportation and residential facilities, reducing pollution problems.
- Rural-Urban Distribution Tamil Nadu Series 34, Director of Census Operations Tamil Nadu, Government of India. Due to better access to health care, educational and social service facilities, infant mortality is less in cities.

CONCLUSION

The percentage of poor people is growing in many countries. Due to such a low income the main goal for the people is to get their daily meal, water and accommodation. For these people the environmental problems are not in the front line. Because of this the solving of environmental problems in developing countries are not easy. The rapid growth rate the country was ranked much lower as compared to other developing nations of South East Asia. The major factors that affected urbanization were increase in population, migration from rural areas. However with the urban growth issues related to development also emerged. There has been increase in slums, reduction in civic amenities, increase in property prices, increase in prices of other essentials and non essential commodities.

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38.GLOBAL CLIMATE CHANGE AND ITS IMPACT ON INDIAN PRODUCTS: A STUDY ON PATANJALI AYURVED LIMITED

Dr. SUNDARI SURESH, Professor, ITM Business School, SIPCOT IT Park College, Chennai.

Dr.C. VIJAI, Assistant Professor, Department of Commerce, Sriram Arts and Science College, Permalpattu, Tiruvallur District, Tamil Nadu.

ABSTRACT

A decade ago Patanjali Ayurveda came with an influential dialogue "no chemicals & swadeshi alternative". In a very few months, Patanjali has become a prime household name. Today, Patanjali Ayurveda Limited is as one of the main players in the Indian FMCG (Fast Moving Consumer Goods) company, and blindly trusted by the people across the country. Patanjali has now become the most prestigious brand in India and has a turnover of more than 2,000 crore in a very short span of time. Patanjali Ayurveda is offering the entire range of FMCG products such as food, grocery, nutrition, hair care, skin care and dental care at much competitive price than the other brands available in the market. The research "A Study of Brand Strategy and the Demand Inclination of the Patanjali Products in India" will provide the information of sales, marketing and the branding strategy of the Patanjali products. We will discuss the factor responsible for the growth of Patanjali Ayurvedic Limited and the future projects by Patanjali Ayurvedic Limited.

KEYWORDS: Environment, Eco-friendly, Global climate change, FMCG, Marketing Strategies, PatanjaliAyurved.

INTRODUCTION

Baba Ramdev established the Patanjali Ayurved Limited in 2006 along with Acharya Balkrishna with the objective of establishing science of Ayurveda in accordance and coordinating with the latest technology and ancient wisdom. Patanjali Ayurved is perhaps the fastest growing fast-moving-consumer goods firm in India with Annual revenue at more than Rs.2,000 crore. It is reported to have said that it expects to take the revenue to a whopping Rs10, 000 crore. The company sources products directly from farmers and cuts on middlemen to boost profits. It is to be noted that Baba Ramdev does not hold any stake in Patanjali Ayurveda Ltd. His partner Acharya Balakrishna is believed to own 92%. The balance 8% stake is held by Sarwan and Sunita Poddar, a Scotland-based NRI couple; who are associated with the UK Trust of Patanjali. Patanjali's proactive moves in innovation have been crucial for its growth; the report says and cautions that the other consumer companies will need to speed up innovations, particularly in the Herbal and Ayurvedic space to counter competition.

OBJECTIVES OF THE STUDY

- To know why consumers prefer Patanjali products
- To study the increasing growth of profit of Patanjali products.
- To know the source of consumer preference
- To know the products customers are expecting from Patanjali
- To study the future prospectus of Patanjali products.

RESEARCH METHODS

This paper depends on secondary data where sources have been utilized to gather data about "Patanjali" brands. Diaries, articles, research reports and government records were explored to get the knowledge of the past intercessions. Web references have additionally been accomplished for accomplishing the reason and goals of the review. Data has been sourced from different books, exchange diaries, government distributions and web. What's more, research is expressive in nature.

OVERVIEW OF PATANJALI AYUURVED LIMITED

Overview

PatanjaliAyurved Limited is an Indian FMCG Company headquartered at Haridwar, Uttarakhand. The Company was established on 13th January, 2006 with Acharya Balkrishna as its majority state holder as well as managing Director with 92% stake, the rest being with an NRI family from UK.

Product Portfolio

It is involved in manufacturing as well as distribution of products ranging from food,

beverages to cosmetics and fabric care. Since its inception in 2006 the company has made rapid advances in expanding its reach across many segments and currently operates a plethora of brands. Its many products include.

Production

Patanjali Food and Herbal Park at Haridwar is the main production facility operated by PatanjaliAyurved. The company plans to establish further units in India and in Nepal.

In 2016, the Patanjali Food and Herbal Park was given a full-time security cover of 35 armed Central Industrial Security Force (CISF) commandos. The park will be the eighth private institute in India to be guarded by CISF paramilitary forces. Baba Ramdev is himself a "Z" category protected of central paramilitary forces

Products

Patanjali Ayurved produces products in the categories of personal care and food. The company manufactures 444 products including 45 types of cosmetic products and 30 types of food products. According to Patanjali, all the products manufactured by Patanjali are made from Ayurveda and natural components Patanjali has also launched beauty and baby products. PatanjaliAyurvedic manufacturing division has over 300 medicines for treating a range of ailments and body conditions, from common cold to chronic paralysis.

Patanjali launched instant noodles on 15 November 2015. Food Safety and Standards Authority of India slapped a notice on the company as neither Patanjali nor Aayush, which are the two brand names under which Patanjali got licenses, have got any approval for manufacturing instant noodles. In 2016, Patanjali has announced to enter the textile manufacturing centre. The company is reported to manufacture not only traditional clothes such as Kurta and Payjama but also popular western clothes such as jeans.

On November 5, 2016, Patanjali announced that it will set up a new manufacturing plant Patanjali Herbal and Mega Food Park in Balipara, Assam by investing ₹1,200 crore (US$180 million) with the manufacturing capacity of 1,000,000 tonnes (2.2×109 lb) of goods per year. The new plant will be the largest facility of Patanjali in India and will be operational by March 2017. Patanjali already has around 50 manufacturing units across.

Sales & Distribution

Patanjali Ayurved sells through nearly 4,700 retail outlets as of May 2016. Patanjali also sells its products online and is planning to open outlets at railway stations and airports. Patanjali Ayurveda has tied up with Pittie Group and Kishore Biyani's Future Group on 9 October 2015 As per the tie-up with Future Group, all the consumer products of Patanjali will be available for the direct sale in Future Group outlets. Patanjali Ayurveda products are also available in modern trade stores including Reliance retail, Hyper city and Star Bazaar apart from online channels PatanjaliAyurved, co-founded by yoga guru Ramdev, is targeting Rs.10,000-crore revenue in 2016-17, after sales grew 150 per cent in the previous financial year to Rs.5,000 crore. PatanjaliAyurved has also started its FMCG expansion in form of dealership and distributorship channels across the country and expects wider growth in overseas distribution as well.

SUCCESS STORY OF PATANJALI – HOW PATANJALI AYURVEDA LTD. ACHIEVED THE MAGIC NUMBERS OF TURNOVER

Yoga guru Ramdev posed yoga as a cure of many health challenges, he started teaching yoga to Indian audience through TV channels Sanskar, Astha etc., and it takes few years when you can see his influence in majority of the people and With the Word of mouth publicity boosting the reach due to these benefits. Many people started claiming that they had been cured using Babaji‟s Yogic methods. Although Patanjali have an excellent gear up but, if they want to compete with the brands like P&G and Hindustan Unilever, they need to establish themselves with a unique positioning.

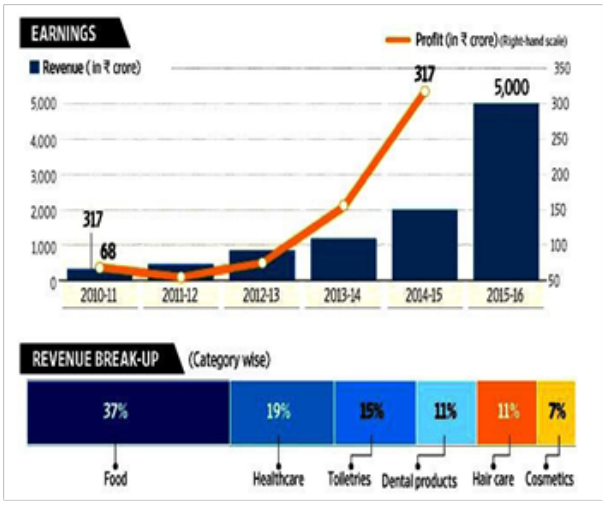

Fig. 1 – Revenue break-up since 2011 to 2015-16 in Crore (Image Source: Internet –Livemint.com)

FUNCTIONAL STRUCTURE OF PATANJALI AYURVED LTD.

Swami Ramdev's medicines are manufactured in branches well equipped with modern equipment's mostly in Haridwar and other places, certified by the international standards GMP, GLP & ISO 9001. Swami Ramdev also has a botanical garden near Patanjali YogPeeth where the herbs and medicinal plants are grown. Here research is carried out on rare herbs and they are grown here by putting in great efforts. Under Swami Ramdev's guidance an industrial unit is also established called Patanjali Ayurved Limited which produces pure and high quality minerals and plants products through scientific methods. Swami Ramdevji and Acharya Balkrishna ji have tried to combine the ancient knowledge with ultramodern technology.

Swami Ramdev is working towards the goal of establishing the ayurvedic products at par with the international standards and to make it known across the world. To encourage the use of Ayurvedic medicine and amongst Swami Ramdev's revolutionary thoughts, one is that the farmers of India should adopt the cultivation of medicinal herbs and plants along with fruits and vegetables.

PATANJALI AYURVED Ltd. is a company that functions like all other companies under the regulations of the company law affairs, yet is constantly striving for nation building more than the profit accumulation.

Bases of Structure of PAL

Superior Quality and Fair Price: this is one of the objects of PAL to provide better quality in very affordable prices.

A holistic approach: A holistic approach to improvement in the quality of life of all beings, world over, is the purpose behind PAL.

Fertilizers: Getting rid the food PAL consume of the pollutants in the form of poisonous pesticides and chemical fertilizers that PAL farmers use, is a goal that we strive to achieve by providing people the eatables that are cultivated in organic and natural manures and pest repellents.

Basic Principles of product development at Patanjali Ayurveda Ltd.

1) Competitive pricing
2) Purity of raw materials used
3) Innovation.
4) Minimum Profit

The reason for Patanjali's success is the thrift in practices. "Our profit margins are miniscule because the main aim is NOT to make profit," says Ramdev." Profiting from patients is against the philosophy of Ayurveda, so we aim at minimum profit from our health products. PAL input costs are low because we source directly from farmers, avoiding middlemen

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The 3 principles vital for growth:

The organization conducts its business on the following 3 main principles:

(1) Providing world-class products to consumers (making sure the company does not add any preservatives or uses natural preservatives as far as possible).

(2) Producing products in the most cost-effective manner so that the products are priced very reasonably.

(3) Whatever profits the company earns are ploughed back into business so that it can invest the same for launch of new products, cost effectiveness or further capacity expansion.

FUTURE PROSPECTUS OF PATANJALI

Rural Push:

Rural market accounts for over 70% of India's 1.21 billion population but contributes only 9% in the FMCG Industry. Thus increasing distribution and support infrastructure in rural areas is a key area where the it needs to focus.

Increment in Research and Development:

FMCG brands would need to concentrate on R&D and advancement as a method for development. In this period of extraordinary rivalry, organizations that keep on doing great would be the ones that have a culture that elevates utilizing client bits of knowledge to make either the up and coming era of items or now and again, new item classes. Along these lines Patanjali would need to contribute a great

deal of capital and exertion into huge innovative work of more up to date item classifications.

Focus on Exports:

Patanjali has to a great extent centered to take into account the residential market. Trades in this manner stay to be a low division of the aggregate deals. It is in this way basic to concentrate on sending out items utilizing Indian operations as sourcing center for the same.

LIMITATIONS OF THE STUDY

As the research have done through the secondary data where research, data, facts, information have already provided either on books, reports, news papers, websites etc. Facts and figures are not directly gathered from the company so that information or data may vary from the real facts. And time constrain has prohibited from going deep into the subject due to time constraints study is restricted to limited places/cities only.

CONCLUSION

On the bases of the findings of the study it can be concluded that Patanjali products have gained significant place in the market and captured quite a huge lot of consumers within a short period of time. Patanjali Ayurvedic Kendra Private Limited has started in Pantnagar with 26 products of medicinal, food and cosmetic category. Shortage of products on Patanjali Ayurvedic Kendra was the major limitation reported by the consumers. Consumers suggested that Patanjali should provide detail information about their products. The delivery system should be improved coupled with regular delivery of products. The need for more and clear advertisement along with promotional camp supported with medical advice to consumers was felt in order to improve consumer acceptability.

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39. RELEVANCE OF ANCIENT INDIAN METHODS OF ENVIRONMENTAL PROTECTION IN THE PRESENT DAY SCENARIO

Dr.B.SHYAMALA, Associate Professor, Department Of Economics, Ethiraj College For Women, Chennai.
SHWETHA.S.S Research Scholar, Department Of Economics, Ethiraj College For Women, Chennai.

ABSTRACT

"The greatest shortcoming of human race is our inability to understand the exponential function"
-Albert.A.Bartlett
In a bid to achieve the twin goals of boosting economic growth and ending extreme poverty, nations have exploited the existing resources without understanding the true cost of its depletion. They are confronted with a resource scarcity crisis as they are unable to satisfy the unlimited wants of human beings with the limited resources. Resources have been used, abused and misused over and above their rate of replenishment. At this juncture, it becomes imperative for nations to understand the concept of "Sustainable Development". Sustainable development refers to development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. The questions for nations is not "whether" to embrace sustainable development but "how" to embrace it. The answer lies in an older school of thought. In ancient India, the inhabitants of the river Indus(Hindus)followed certain practices that were environment friendly with or without their knowledge. They embraced nature as an integral part of their life. Hindus have long had a palpable and organic connection with nature. In this paper, "Hinduism" is considered as "a way of life" that was practiced by our forefathers and not merely as a religion. Ancient Indian texts like Vedas, Puranas and Upanishads clearly describe the eco-friendly attitude of Hindus. Plants and trees are valued so highly in Hindu sacred texts that their destruction is connected with doomsday scenario. For the same reason, almost every temple in South India dedicated to Lord Shiva or Vishnu, or to a manifestation of the goddess, has a "sthalavriksha", a special tree regarded as sacred to that area. The sthalavriksha symbolizes all trees and reminds pilgrims that all trees are worthy of respect. Similarly, in older days, people revered rivers, mountains, forests and animals. For example, many villages had a sacred lake, and around it a grove of trees to catch rainfall and protect the banks from erosion. The lake and its grove would store rainfall to irrigate surrounding fields and also to provide drinking water to the local community. In recent times, the neglect of these simple techniques for gathering and protecting clean water has led to serious water shortage crisis. These are just few among many traditions followed by our forefathers. The objective of this paper is to study the traditional techniques of environmental protection that were followed in ancient India and to provide suggestions to government entities, NGO's and International organizations for embracing those techniques for a sustainable future. It is high time to seek lessons from the spiritual heritage of our country as they offer a unique set of moral values and customs that serves as a guide in nurturing the relationship between man and nature, thereby, leading to a sustainable future.

INTRODUCTION

The aim of every nation is to achieve the twin goals of maximizing economic growth and minimizing poverty.In the process, countries have caused irreparable damage to the environment by over exploiting the existing resources without understanding the true cost of its depletion. Now, they are confronted by various issues such as pollution, water crisis, energy crisis and environmental degradation to name a few. A lot of expenditure has been incurred towards R&D by governments and international organizations in a bid to find solutions for a sustainable future. What countries have failed to realize is the abundance of knowledge contained in its own spiritual and cultural heritage. This is particularly true in the case of oriental countries. India has a great source of information pertaining to environmental protection in its sacred books like Vedas, Upanishads and Puranas. These traditional views hold good even in the 21st century. This paper attempts to study the role of Hinduism in protecting the environment for a sustainable future. Also, Hinduism is viewed purely as a way of life and not as a religion.

OBJECTIVE OF THE PAPER

The two main objectives of this paper are as follows:
a)To study the traditional techniques of environmental protection that were followed in ancient India.
b)To provide suggestions to government entities, NGO's and International organizations for embracing ancient techniques of environmental protection for a sustainable future.

ANCIENT METHODS OF ENVIRONMENTAL PROTECTION

India possesses a great-diversified ecosystem containing forests, wetlands, islands, estuaries, parks, landscapes, oceans and a rich blend of natural surroundings. Many customary or community practices were evolved by our ancestors to protect the environment. This is very evident from our Hindu culture.Hindu religion's reverence for the sea, soil, forests, rivers, mountains, plants, birds, and animals stems from its broader view of divinity. Hindus believe that all things and beings in the world are various manifestations of the Ultimate Reality (Brahman), and nothing exists apart from it. The whole emphasis of Hindu scriptures is that human beings cannot separate themselves from nature.
Several decades ago, Hindu sages realized that preservation of environment was necessary for survival of mankind. To create awareness among common people for preservation of the environment, the rishis taught that earth has the same relationship with man as a mother with her child. In the Vedic literature, the earth is addressed as Mother Earth and personified as the goddess "Bhumi", or "Prithvi". Five thousand years later, the world experts addressed earth as "Mother Earth" for the first time at the "Global Conference" in 1992 in "Rio de Janeiro".
There are numerous messages contained in Hindu scriptures for the protection of our environment and the maintenance of ecological balance. The following are a few examples of some of these timeless teachings to tackle the issues of deforestation, climate change, pollution and environmental degradation.
Since time immemorial, forests have been an integral part of the livelihood of mankind. The early inhabitants of India were well aware of the numerous benefits that forests could provide. As early as in the time of Rigveda, tree worship was quite popular and universal. The tree symbolized the various attributes of God to the Rigvedic seers. During the period of the great epics and Puranas, the Hindu respect for flora expanded further. Trees were considered as being animate and it is still popularly believed that every tree has a Vriksa-devata, or 'tree deity', who is worshipped with prayers and offerings of water, flowers, sweets, and encircled by sacred threads. Also, for Hindus, the planting of a tree is still a religious duty. The Hindu worship of trees and plants has been based partly on utility, but mostly on religious duty and mythology. Hindu ancestors considered it their duty to save trees and in order to do that they attached to every tree a religious sanctity.
In the Bhagavad Gita, Krishna compares the world to a single banyan tree with unlimited branches in which all the species of animals, humans and demigods wander. Indian consciousness is full of trees and forests. If you look, for example, in Greek literature, you will find only a few descriptions of trees and forests, whereas Indian literature such as Ramayana and Mahabharata is full of such descriptions, as if the people were always under a tree. The bond between Indian people and trees is very strong.
Hindu tradition describes three basic categories of forest. One is "Shrivan", the forest which provides prosperity. Then there is "Tapovan", where one can contemplate as the sages did and seek truth. The third is "Mahavana" the great natural forest where all species of life find shelter. Each of these categories must be preserved.
Forests and groves were considered sacred, and flowering trees received special reverence. Just as various animals were associated with gods and goddesses, different trees and plants were also associated in the Hindu pantheon. The Mahabharata says that 'even if there is only one tree full of flowers and fruits in the village, that place becomes worthy of worship and respect.'
Hindus see divinity in all living creatures. Animal deities therefore, occupy an important place in Hindu dharma. Animals, for example, are very common as a form of transportation for various Gods and Goddesses. Each divinity is associated with a particular animal or bird, and this lends a special dimension to the animal kingdom.
As the sheep is to Christianity, the cow is to Hinduism. Lord Krishna was a cowherd, and the bull is depicted as the vehicle of Lord Shiva. Today the cow has almost become a symbol of Hinduism. In India, the cow is believed to be a symbol of the earth because it gives so much yet asks nothing in return.

Lord Krishna Says in the Bhagvad Gita (9.26)
Patrampushpampahalamtoyam
Yomeybhaktyaprayachchatitadanambhaktyup
ahrumtamasna
(If I accept a flower, fruit or water or whatever is offered with devotion)

Apart from attaching religious significance to plants and trees, Hindus also revered them for their medicinal properties.

All plants and flowers have medicinal value in the Hindu system of medicine (ayurveda) brought by "Dhanvantari" - The father of Ancient Indian Medicine System during Samudramathana (churning of oceans).

For example, the Tulsi plant has great medical significance. It is used to prevent and cure many illnesses and ailments like cold, headaches, stomach disorders, inflammation, heart diseases and malaria.

The story of Lord Krishna has it that when Krishna was weighed in gold, not even all the ornaments of Satyabhama could outweigh him. But a single tulsi leaf placed by Rukmani on the pan tilted the scale. In the Hindu stories, tulsi is very dear to Lord Vishnu.

Hindus oppose killing for several reasons. Belief in karma and reincarnation are strong forces at work in the Hindu mind. What we have done to others will be done to us, if not in this life then in another. The Hindu is thoroughly convinced that violence which he commits will return to him by a cosmic process that is unerring. For the same reason, many Hindus adhere to a strict vegetarian diet also. They believe that any harm caused to any living being will backfire on them since they believe in the "Doctrine of karma". Two thousand years ago, South India's saint Tiruvalluvar said it so simply, "All suffering recoils on the wrongdoer himself. Therefore, those who desire not to suffer refrain from causing others pain."

ILLUSTARTIONS OF ANCIENT TRADITIONS FOLLOWED IN INDIA

In India, there is a small community called "Bishnois" in Rajasthan. They practice a religion of environmental conservation. Their religion is an offshoot of Hinduism and was founded by "Guru MaharajJambaji" during the Marwar era. When he was young he witnessed how, during a severe drought, people cut down trees to feed animals but when the drought continued, nothing was left to feed the animals, so they died. Jambaji thought that if trees are protected, animal life could be sustained, and his community would survive. He gave 29 injunctions and principles, among them being a ban on the cutting of any green tree and killing of any animal or bird. About 300 years later, when the King of Jodhpur wanted to build a new palace, he sent his soldiers to the Bishnois area where trees were in abundance. Villagers protested, and when soldiers did not pay attention to their protests, the Bishnois, led by a woman, hugged the trees to protect them with their bodies. As soldiers kept on killing villagers, more and more of the Bishnois came forward to honour the religious injunction of their Guru MaharajJambaji. This massacre continued until 363 persons were killed defending trees. When the king heard about this human sacrifice, he stopped the operation, and gave the Bishnois state protection for their belief. Today, the Bishnois community continues to protect trees and animals with the same fervour. Their community is the best example of a true Hindu-based ritual defense of the environment in India, and their sacrifices became the inspiration for the Chipko movement of 1973.

HINDUISM AND SUSTAINABLE DEVELOPMENT

The abuse and exploitation of nature for immediate gain is unethical and unjust. No culture has remained immune from human irreverence towards nature. Hinduism in particular is against environmental degradation. They have laid emphasis on the importance of protecting the environment for future generations. For instance, the caste system which has been a subject of debate for decades was instituted for the sake of managing the resources efficiently. The society was divided into different classes and each class specialized on a particular profession. This is similar to the concept of division of labour and this ensured that the resources were put to proper use. There was no fear of encroachment from other classes when people were employed with a particular job profile. . When we look at it from a different perspective, it throws light on the concept of sustainable development where people judiciously used the resources by keeping aside enough for future generations.

As Mahatma Gandhi cited, "nature had enough for everybody's need but not for everybody's greed." The budding issue in today's world is the poor belief system in our ancient customs and traditions. In a country like India, it is definitely easier for people to follow these practices provided they are incorporated as a part of their ritual. The Hindu religion teaches a renunciation of worldly goods, and preaches against materialism and consumerism. Such teachings could act as a great source of strength for Hindu societies in their struggle to achieve sustainable development.

SUGGESTIONS FOR EMBRACING TRADITIONAL METHODS OF ENVIRONMENTAL CONSERVATION

As former President of India Dr.A.P.J.AbdulKalam said, "The future of India lies in the hands of the youth".

=>Governments should implement environmental courses for children that are culture and value based right at the school level. Lessons from Western countries should be kept at a minimum.

=>Students should be encouraged to plant saplings in the school and college premises as a part of their curriculum.

=>Good aspects from every religion regarding protection of environment should be taken as an input in framing environmental policies.

These are just few suggestions that are specifically targeted towards youngsters as they are capable of bringing a change in the society.

CONCLUSION

It is clear that the need of the hour is a revival of respect for ancient cultural values. This revival need not turn into fundamentalism but could definitely be based on the relevant concepts enshrined in our ancient Indian texts. The message should be to adorn atraditionalist approach by incorporating spiritual guidance into the various socio-economic interactions without causing any harm to secularism. "Satyagraha for conservation" could very well be a rallying point for the awakened spirit of Hinduism. I believe that by incorporating traditional values in to rituals, we can evoke a kind of awareness in people that is different from scientific or technological reasoning. Hinduism helps make human beings aware that there are limits to their control over animate and inanimate world and that their arrogance and manipulative power over nature can backfire. Religion instills the recognition that human life cannot be measured by material possessions and that the ends of life go beyond conspicuous consumption. Secular institutions, national governments, and international organizations should acknowledge the role of cultural values in environmental education. There are definitely several disagreements among world religions but a mixture of key ideas from each of them pertaining to conservation could definitely lead to a new global environmental ethic.

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40. IMPACT OF CLIMATE CHANGES ON TOURISM DEVELOPMENT IN INDIA

Dr.S.SENDIL KUMAR, Assistant Professor, P.G and Research Department of Economics, Voorhees College, Vellore.

Mr.ANANTHA BABU.V, Ph.D. Research Scholar, P.G and Research Department of Economics, Voorhees College, Vellore.

ABSTRACT

Eco tourism, also known as ecological tourism, is travel to natural areas to appreciate the cultural and natural history of the environment, while not disturbing the integrity of the ecosystem and creating economic opportunities that make conservation and protection of natural resources advantageous to local people. Ecotourism also minimizes wastage and the environmental impact through sensitized tourists. Tourists look for an ecologically clean, non-polluted and unharmed natural environment to make their trip or vacation, so tourist activities take place mostly in ecologically clean territories. The existence of any ecological problem in a territory – pollution with hard waste materials, water pollution, high soil acidity, disrupted and annihilated vegetation, noise pollution, existence of noxious emissions in the air etc. affect tourism development in it in a most negative way. Existence of ecological problems is one of the strongest restricting factors for modern tourism development and so they are an important criterion for assessing tourism potential. Some of the tourists evince keen interest in nature. There is abundant natural wealth in Tamil Nadu viz. hill stations, waterfalls, forests, bird sanctuaries, beaches, etc. A separate Eco-Tourism Wing is being set up by Tamil Nadu Tourism by posting an officer from the Forest Department. The vision is to make Tamil Nadu a world renowned destination specializing in sustainable tourism through focused efforts on creating synergy among all stakeholders, encouraging capacity building and public-private partnerships with revenue generating strategies.

This research paper focuses on an impact of Tourism on climatic changes in Tamilnadu. The researcher is an analysis the role of climate changes in tourism development through the secondary data from the various published sources.

KEYWORDS: climate changes and Tourism development.

INTRODUCTION

The quality of the environment, both natural and man-made, is essential to tourism. However, the relationship of tourism with the environment is complex. It involves many activities that can have adverse environmental effects. Many of these impacts are linked with the construction of general infrastructure such as roads and airports, and of tourism facilities, including resorts, hotels, restaurants, shops, golf courses and marinas. The negative impacts of tourism development can gradually destroy environmental resources on which it depends. On the other hand, tourism has the potential to create beneficial effects on the environment by contributing to environmental protection and conservation. It is a way to raise awareness of environmental values and it can serve as a tool to finance protection of natural areas and increase their economic importance Negative impacts from tourism occurs when the level of visitor use is greater than the environment's ability to cope with this use within acceptable limits of change. Uncontrolled conventional tourism poses potential threats to many natural areas around the world. It can put enormous pressure on an area and lead to impacts such as soil erosion, increased pollution, discharges into the sea, natural habitat loss, increased pressure on endangered species and heightened vulnerability to forest fires. It often puts a strain on water resources, and it can force local populations to compete for the use of critical resources.

OBJECTIVES

This paper aims to fulfill the following purposes;

→ To see the positive and negative impact of tourism on environment.

→ To identify the improvement in Environmental Management and Planning.

RESEARCH METHODOLOGY

The study has been conducted mainly on the basis of literature survey and secondary

information. Various seminar papers and summary of discussion in those seminars, taskforce reports of research organization, journals and some periodicals on environmental impacts of tourism have been surveyed for the purpose of the study. Some environmental analyst and expertise person has also been interviewed for the purpose of accumulating facts and information.

TOURISM IN TAMILNADU

Tamil Nadu, formerly known as Madras State, is located in the south eastern side of Indian peninsula with Kanyakumari as the southernmost tip of the land. This tip is the meeting point of Bay of Bengal, Indian Ocean and Arabian Sea. Tamil Nadu has a long eastern coastline dotted with enchanting beaches with Bay of Bengal in the east. Arabian Sea and the states of Kerala and Karnataka form the boundary in the west. The state is bounded in the north by the states of Karnataka and Andhra Pradesh The state language is Tamil and the main religions in the state are Hinduism, Christianity, Islam and Jainism. With forested slopes of the majestic hills of the Western Ghats, profuse incense of the towering temples and gourami, vibrant festivals of music and dance, shimmering silk fabrics of brilliant colors, and an endless array of silver lined beaches, Tamil Nadu also boasts of being the land of Dravidian culture and tradition. Tamil Nadu is the eleventh largest state in India by area and the seventh most populous state. It is the second largest state economy in India as of 2012. The state ranked among the top five states in India in Human Development Index as of 2006. Tamil Nadu is also the most urbanized state in India. The state has the highest number of business enterprises and stands second in total employment in India, compared to the population share of about 6%.

Tamil Nadu has a long tradition of venerable culture. Tamil Nadu is known for its rich tradition of literature, music and dance which continue to flourish today. Unique cultural features like Bharatanatyam (dance), Tanjore painting, and Tamil architecture were developed and continue to be practiced in Tamil Nadu. Pongal, also called as Tamizhar Thirunaal (festival of Tamils) or Makara Sankranti elsewhere in India, a four-day harvest festival is one of the most widely celebrated festivals throughout Tamil Nadu. Keeping this in mind the Market Research Division of Ministry of Tourism, Government of India has awarded Nielsen India Pvt. Ltd. (Formerly ACNielsen ORG-MARG), one of the largest market research and consultancy organizations in this part of the continent, to conduct a study for a period of one year for collection of Tourism Statistics.

TOURISM AND ITS IMPACT ON ENVIRONMENT

Like most of the human activities, tourism also has positive and negative impact on the society and environment as a whole. For the purpose of the research, it is important to assess and examine both the positive and negative impacts in a neutral way. The quality of the environment, both natural and man-made, is essential to tourism. However, tourism's relationship with the environment is complex. Many of these impacts are linked with the construction of general infrastructure such as roads and airports, and of tourism facilities, including resorts, hotels, restaurants, shops, golf courses and marinas. The negative impacts of tourism development can gradually destroy the environmental resources on which it depends. On the other hand, tourism has the potential to create beneficial effects on the environment by contributing to environmental protection and conservation. It is a way to raise awareness of environmental values and it can serve as a tool to finance protection of natural areas and increase their economic importance.

POSITIVE IMPACT OF TOURISM

a. Generating Income and Employment:

Tourism in India has emerged as an instrument of income and employment generation, poverty alleviation and sustainable human development. It contributes 6.23% to the National GDP and 8.78% of the total employment in India. Almost 20 million people are now working in the India's tourism industry.

b. Source of Foreign Exchange Earnings:

Tourism is an important source of foreign exchange earnings in India. This has favorable impact on the balance of payment of the country. The tourism industry in India generated about US$100 billion in 2008 and that is expected to increase to US $ 275.5 billion by 2018 at a 9.4% annual growth rate179.

c. Preservation of National Heritage and Environment:

Tourism helps preserve several places which are of historical importance by declaring them as heritage sites. For instance, the Taj Mahal180, the Qutab Minar181, Ajanta182 and Ellora183 temples, etc, would have been decayed and destroyed had it not been for the efforts taken by Tourism Department to preserve them. Likewise, tourism also helps in conserving the

natural habitats of many endangered species.

d. Developing Infrastructure:

Tourism tends to encourage the development of multiple-use infrastructure that benefits the host community, including various means of transports, health care facilities, and sports centers, in addition to the hotels and high-end restaurants thatcater to foreign visitors. The development of infrastructure has in turn induced the development of other directly productive activities.

e. Promoting Peace and Stability:

Honey and Gilpin (2009) suggests that the tourism industry can also help promote peace and stability in developing country like India by providing jobs, generating income, diversifying the economy, protecting the environment, and promoting cross-cultural awareness. However, key challenges like adoption of regulatory frameworks, mechanisms to reduce crime and corruption, etc, must be addressed if peace-enhancing benefits from this industry are to be realized.

f. Improved Environmental management and Planning:

Sound environmental management of tourism facilities and especially hotels can increase the benefits to natural environment. By planning early for tourism development, damaging and expensive mistakes can be prevented, avoiding the gradual deterioration of environmental assets significant to tourism. The development of tourism has moved the Indian Government towards this direction leading to improved environmental management.

g. Creating Environmental Awareness:

Tourism has the potential to increase public appreciation of the environment and to spread awareness of environmental problems when it brings people into closer contact with nature and the environment. This confrontation heightens awareness of the value of nature among the community and lead to environmentally conscious behavior and activities to preserve the environment.

NEGATIVE IMPACT ON ENVIRONMENT:

Tourism can cause the same forms of pollution as any other industry are emissions, noise, solid waste and littering, releasing of sewage, oil and chemicals, even architecture/visual pollution.

a. Depletion of Local Resources:

Tourism can create pressure on local recourses like energy, food, and transport of these resources exacerbates the physical impacts associated with their exploitation. Because of the seasonal character of the industry, many destinations have ten times more inhabitants in the high season. A high demand is placed upon these recourses to meet the high expectorations tourists often have proper heating, hot water, etc.

b. Land degradation:

Important land recourses include minerals, fossil fuels, fertile soil, forests, wetland and wildlife. Increases construction of tourism and recreational facilities has increased the pressure on these recourses and scenic landscapes. Direct impact on natural recourses, both renewable and nonrenewable, in the provision of tourist facilities is caused by the use of land for accommodation and other infrastructure provision, and the use of building materials.

c. Water Pollution:

Water especially, is one of the most critical natural resources. The tourism industry generally overuses water resources for hotels, swimming fools, golf courses and personal use of water by tourists. This can result in water shortages and degradation of water supplies, as well as generating a greater volume of wastewater. In dryer regions like Rajasthan, the issue of water scarcity is particular concern. If a proper sewage disposal system has not been installed for hotels, resorts and other tourist facilities, there may be pollution of ground water from the sewage, or if a sewage outfall has been construed into a nearby river, lake or coastal seawater and the sewage has not been adequately treated, the effluent will pollute that water area.

This situation is common in beach resort areas where the hotels construct an outfall into the adjacent water area, which can also be used for swimming by tourists or for fishing by locals. Recreational and tourist transportation motor boats in surface water result in pollution in river, lakes and sea water due to spilling oil and gas and cleaning their bilge in water. This is usually common in enclosed harbor and places where natural water circulation is slow. Water

resources are a prime attraction for tourism and recreational developments, and thus suffer impacts. Water pollution is a result of waste water generated by tourist facilities and runoff, and occurs on inland lakes and streams as well as in the marine environment. Much of this is non-point pollution such as septic tank seepage, lawn fertilizer, road oil and runoff from disturbed soil.

d. Air Pollution:

Tourism is generally considered a "smokeless industry". However, it can also result in air pollution by tourist vehicles in a particular area, especially at major attraction sites, that are accessible only by road. This is due to improperly maintained exhaust systems of the vehicles. In addition, pollution in the form of dust and dirt in the air may be generated from open, if the tourism development is not properly planned, developed and landscaped or is in an interim State of construction. Transport by Air, road, and rail is continuously increasing in response to the rising to the rising number of tourists activities in India. Transport emissions and emissions from energy production and use are linked to acid rain, global warming and photochemical pollution. Air pollution from tourists' transportation has impacts on the global level, especially from carbon dioxide (CO2) emissions related to transportation energy use. In addition, it can contribute to severe local air pollution. Some of these impacts are quite specific to tourist activities where the sites are in remote areas like Ajanta and Ellora temples. For example, tour buses often leave their motors running for hours while the tourists go out for an excursion because they want to return to a comfortably air-conditioned bus.

e. Noise Pollution:

Noise generated by a concentration of tourist's road and certain types of tourist attractions such as amusement parks or car/motorcycle race tracks may reach uncomfortable and irritating levels for nearby residents and other tourists. Such loud noise can often result in ear damage and psychological stress. Noise pollution from airplanes, cars, and buses, as well as recreational vehicles is an ever-growing problem of modern life. In addition to causing annoyance, stress, and even hearing loss for humans, it causes distress to wildlife, especially in sensitive areas.

f. Visual Pollution:

It may result from several sources. These can be due to poorly- designed hotels and other facility buildings, which are not compatible with local architectural style or not well integrated into the natural environment. Other reasons can be poor maintenance of buildings and landscaping obstruction of scenic views by development use of large and ugly advertising signs. Littering of landscape also results in visual pollution.

g. Aesthetic Pollution:

Often tourism fails to integrate its structures with the natural features and indigenous architectural of the destination. Large, dominating resorts of disparate design can look out of place in any natural environment and may clash with the indigenous structural design. A lack of land-use planning and building regulations in many destinations has facilitated sprawling developments along coastlines, valleys and scenic routes. The sprawl includes tourism facilities themselves and supporting infrastructure such as roads, employee housing, parking, service areas, and waste disposal.

h. Waste Disposal Problems:

The most common problem in tourism areas is the littering of debris on the landscape. This is due to large number of people using the area of picnicking. Improper disposal of solid waste from hotel restaurants, and resorts generate both litter and environmental health problems from vermin, disease and pollution. It can also lead to the degradation of tourist sites. In areas with high concentrations of tourist's activities and appealing natural attractions, waste disposal is a serious problem and improper disposal can be a major despoiler of the natural environment-rivers, scenic areas, and roadsides. In mountain areas of the Himalayas and Darjeeling their garbage, oxygen cylinders and even camping equipment. Such practices degrade the environment particularly in remote areas because they have few garbage collection or disposal
facilities.

i. Sewage:

Construction of hotels, recreation and other facilities often leads to increased sewage pollution. Wastewater has polluted seas and lakes surrounding tourist attractions, damaging the flora and fauna. Sewage runoff causes serious damage to coral reefs because it stimulates the growth of algae, which cover the filter feeding corals, hindering their

ability to survive. Changes in salinity and siltation can threaten the health of humans and animals. Examples of such pollution can be seen in the coastal States of Goa, Kerala, Maharashtra, TamilNadu, etc. Nearly all impact studies have been concerned with natural or semi-natural areas, with very little work focused on urban settings. Additionally, most research has been reactionary and centered on the negative impacts that tourism has on natural resources after the damage has taken place. Thus, it is difficult to document the process of environmental change resulting from tourism activity. Tourism is often blamed to an unreasonable degree for resource degradation. While tourism does at times result in negative environmental impacts, there are also environmental benefits associated with tourism, including fostering appreciation for the environment.

j. Destruction and Alteration of Ecosystem:

An ecosystem is a geographic area including the entire living organism (people, plants, animals, and microorganisms) their physical surroundings such as soil as soil, water, and air) and the natural cycles that sustain them. Attractive landscape sites, such as sandy beaches in Goa, Maharashtra, Kerala, TamilNadu, lakes, riversides, and mountaintops and slops, are often transitional Zones, characterized by species-rich ecosystems. The threats to and pressures on these ecosystems are often severe because such places are very attractive to both tourists and developers. Examples may be cited from Krushedei Island near Rameswaram. What was once called paradise for marine biologists has been abandoned due to massive destruction of coral and other marine life.

Another area of concern, which emerged at jaisalmer, is regarding the deterioration of the desert ecology due to increased tourist activities in the desert. Moreover, habitat can be degraded by tourism leisure activities. For example, wildlife viewing can bring about stress for the animals and alter their natural behavior when tourists come too close. Safaris and wildlife watching activities have a degrading effect on habituate as they often are accompanied by the noise and commotion created by tourists.

k. Adverse effects of excessive tourism on wetlands:

Excessive tourism affects wetlands in a variety of ways. Here are some of them. Reduced Arrival of Migratory Birds - the phenomenon of migratory birds flying thousands of miles in winter to reach a far away lake and then to start their back journey after three months or so is mind bogging. However, one thing is certain that these birds go to the particular lakes because they find the environment friendly and peaceful and food supply abundant.

l. Solid waste and littering:

In areas with high concentrations of tourist activities and appealing natural attractions, waste disposal is a serious problem and improper disposal can be a major despoiler of the natural environment - rivers, scenic areas, and roadsides. For example, cruise ships in the Caribbean are estimated to produce more than 70,000 tons of waste each year. Today some cruise lines are actively working to reduce waste-related impacts. Solid waste and littering can degrade the physical appearance of the water and shoreline and cause the death of marine animals

IMPROVED ENVIRONMENTAL MANAGEMENT AND PLANNING

Sound environmental management of tourism facilities and especially hotels can increase benefits to natural areas. But this requires careful planning for controlled development, based on analysis of the environmental resources of the area. Planning helps to make choices between conflicting uses, or to find ways to make them compatible. By planning early for tourism development, damaging and expensive mistakes can be prevented, avoiding the gradual deterioration of environmental assets significant to tourism. Cleaner production techniques can be important tools for planning and operating tourism facilities in a way that minimizes their environmental impacts. For example, green building (using energy-efficient and non-polluting construction materials, sewage systems and energy sources) is an increasingly important way for the tourism industry to decrease its impact on the environment. And because waste treatment and disposal are often major, long-term environmental problems in the tourism industry, pollution prevention and waste minimization techniques are especially important for the tourism industry (UNEP, 1995, 1997, 1998; WTO, 1995).

Environmental Awareness Rising

Tourism has the potential to increase public appreciation of the environment and to spread

awareness of environmental problems when it brings people into closer contact with nature and the environment. This confrontation may heighten awareness of the value of nature and lead to environmentally conscious behavior and activities to preserve the environment. If it is to be sustainable in the long run, tourism must incorporate the principles and practices of sustainable consumption. Sustainable consumption includes building consumer demand for products that have been made using cleaner production techniques, and for services including tourism services that are provided in a way that minimizes environmental impacts. The tourism industry can play a key role in providing environmental information and raising awareness among tourists of the environmental consequences of their actions. Tourists and tourism-related businesses consume an enormous quantity of goods and services; moving them toward using those that are produced and provided in an environmentally sustainable way could have an enormous positive impact on the planet's environment (UNEP, 1992).

Protection and Preservation

Tourism can significantly contribute to environmental protection, conservation and restoration of biological diversity and sustainable use of natural resources. Because of their attractiveness, pristine sites and natural areas are identified as valuable and the need to keep the attraction alive can lead to creation of national parks and wildlife parks. In Hawaii, new laws and regulations have been enacted to preserve the Hawaiian rainforest and to protect native species. The coral reefs around the islands and the marine life that depend on them for survival are also protected. Hawaii now has become an international center for research on ecological systems and the promotion and preservation of the islands' tourism industry was the main motivation for these actions.

Tourism has had a positive effect on wildlife preservation and protection efforts, notably in Africa but also in South America, Asia, Australia, and the South Pacific. Numerous animal and plant species have already become extinct or may become extinct soon. Many countries have therefore established wildlife reserves and enacted strict laws protecting the animals that draw nature-loving tourists. As a result of these measures, several endangered species have begun to thrive again (IUCN, 1996; UNEP and WTO, 1992; WWF, 1992; www. unepie. org/tourism).

Regulatory Measures

Regulatory measures help offset negative impacts; for instance, controls on the number of tourist activities and movement of visitors within protected areas can limit impacts on the ecosystem and help maintain the integrity and vitality of the site. Such limits can also reduce the negative impacts on resources. Limits should be established after an in-depth analysis of the maximum sustainable visitor capacity. This strategy is being used in the Galapagos Islands, where the number of ships allowed to cruise in this remote archipelago is limited, and only designated islands can be visited; ensuring visitors have little impact on the sensitive environment and animal habitats (UNEP, 1998; UNEP, 1997; www.unipie.org/tourism).

CONCLUSION

Tourism industry in India is growing and it has vast potential for generating employment and earning large amount of foreign exchange besides giving a fillip to the country's overall economic and social development. However, much more remains to be done. Eco-tourism needs to be promoted so that tourism in India helps in preserving and sustaining the diversity of the India's natural and cultural environments. Tourism in India should be developed in such a way that it accommodates and entertains visitors in a way that is minimally intrusive or destructive to the environment and sustains & supports the native cultures in the locations it is operating in. Moreover, since tourism is a multi-dimensional activity, and basically a service industry, it would be necessary that all wings of the Central and State governments, private sector and voluntary organizations become active partners in the Endeavour to attain sustainable growth in tourism if India is to become a world player in the tourism industry.

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41. IMPACT OF TANNERIES WASTE DISPOSAL ON ENVIRONMENT WITH SPECIAL REFERENCE TO VELLORE DISTRICT TAMIL NADU

Mr. K. THOUFEEQ AHMED, Assistant Professor of Commerce (Corporate Secretaryship), Mazharul Uloom College, Ambur, Vellore District.
(Ph.D Research Scholar, Jamal Mohammed College Tiruchirapalli – 620020)
Cell : +91 97914 15512 E-Mail: prof.thoufeeq@gmail.com.

ABSTRACT

The Leather Industries occupies a place of prominence in the Indian economy in view of its massive potential for employment, growth and export. There has been increasing emphasis on its planned development aimed at optimum utilization available raw material for maximizing the returns particularly from exports. This paper aims at understanding the impact of tanneries waste disposal on environment. From the very beginning of industrialization in India, tanning industries have been playing a significant role in the country's economy. Due to its importance as a labor based export oriented industry the full flourish of this industrial sector is essential. But due to the absence of proper waste management, using inferior technologies, lack of facilities for treating industrial wastes; the tanning industries especially located in Vellore district are aggravating environmental problems day by day. The discharging and dumping of wastes near the water bodies without treatment makes it almost look like an area which is lying under the blanket of pollution. It is an emerging problem not only for the environment but also as the social context of the country. This study focuses on the tanneries located in Vellore District to assess the present situation arising from such activities and proposed several mitigation measures.

KEYWORDS: Tanneries, Water Pollution, Air Pollution, Environment, Mitigation Measures

INTRODUCTION

Over the years the Indian Leather Industry has undergone drastic change from being a mere exporter of raw materials in the early 60's and 70's to an exporter of finished, value-added leather products. The main reason behind this good transformation is the several policy initiatives taken by the Government of India. Indian leather industry currently is one among the top 8 industries for export revenue generation in India, holding 10% of the global raw material, and 2% of the global trade. India has become biggest livestock producer in the world with the capacity of 1.8 billion sq. Feet of leather production annually. Global footwear of 13% production comprising of 16 billion pairs are made in India.

Ambur, Vaniyambadi and Ranipet are important industrial areas of Vellore District. Many tannery industries have been developed in these areas. The industries expanded frequently when ever orders increased from the overseas. The Vellore district was selected because of its long history of widely known discharge of chromium based tanning effluents. About approx 400 tons of solid waste is generated per day during peak season and approx 125 tons during off-peak season from the tanneries in Vellore district. Vellore district is situated mainly beside of Palar River. The present study aims at investigating the impacts of tannery waste disposal on water, and its impact on environment.

STRUCTURE OF TANNERIES

The Tanneries is spread in different segments like,

→ Raw to Wet Blue Tanning

At this process most of the hazardous chemicals were used for converting the raw skin to wet blue like huge percentage of chrome and sulphite, sodium sulphite, ammonium bi carbonate etc.

→ Wet Blue to Crust Conversion Process

At this Process oftenly the Syntan and Oil products were used for converting the raw skin to wet blue like Chrome Syntan, dye leveling, melamine Syntan, Sperm based oil, fish oil, lecithin oils etc

→ Crust to Finished Leather

At this stage mostly liquid chemicals were used which is most dangerous as a results it is saviour effect on human health.

OBJECTIVES OF THE STUDY

- To describe present scenario of the existing surrounding environment.
- To promote environmental awareness of population.

REVIEWS ON LEATHER INDUSTRIES

There has been an increasing emphasis on its planned development, aimed at optimum utilization of available raw materials for maximizing the returns, particularly from exports. India ranks first among major livestock

holding countries in the world and thus has a rich endowment of raw materials in terms of the cattle population. Information is provided on the micro structure of the Indian leather industry. The modernization of leather industry and set up of new unit for footwear, components and leather products results in terms of productivity, rightsizing of capacity, cost-cutting, and design-development will give way to further development to this industry. (Center for Management Research (CMR) 20053).

Apart from the quality of raw material, the process of its conversion into leather and later of the design, product development and process of manufacture of leather products play a key role in adding value to leather industry (The Indo-Italian Chamber of Commerce & Industry 20084).

REVIEWS ON ENVIRONMENT

According to Imamul Huq (1998), various chemicals are used during the soaking, tanning and post tanning processing of hides and skins. The main chemicals used include sodium sulphite and basic chromium sulphate including non-ionic wetting agents, bactericides, soda ash, CaO, ammonium sulphide, ammonium chloride and enzymes. Others are sodium bisulphate, sodium chlorite, NaCl, H2SO4, formic acid, sodium formate, sodium bicarbonate, vegetable tannins, syntans, resins, polyurethane, dyes, fat emulsions, pigments, binders, waxes, lacquers and formaldehyde. Various types of processes and finishing solvents and auxiliaries are used, as well.

PROFILE OF STUDY AREA:

The Most Popular Leather Industries In and Around Vellore District

COMPANY	YEAR	FOUNDER	PLANT	EMPLOYMENT
Farida Groups	1957	Haji Mecca Abdul Majid Sahib	12	7000+
KH Group	1982	Khizar Hussain	4	7000
NMZ	1972	N M Zackriah	5	1800
TAW	1949	T. Abdul Wahid	3	3400
Florence	1979	Aqueel Ahmed	10	4000+

TANNERIES WASTAGE IMPACT ON ENVIRONMENT

In the tanning process many chemicals such as Chromium oxide, ammonium sulfate, formic acid, sulfuric acid, sodium chloride etc are used which causes solid and liquid wastes. In the processing of raw hide and skin the sulphuric acid and salt are used and then it was treated with the solutions of chromium salts. In the tannery chromium, HCl, Sulphuric acid, Formic acid, Caustic soda, Caustic potash, Soda ash, Sodium arsenate, Arsenic sulphite etc is used for different tanning process such as soaking, liming, deliming, tanning etc. At the end of every process the chemicals are washed by water which causes liquid waste. The major solid wastes generated by the tanneries are dusted curing salt, wet trimmings, dry trimmings, wet shaving, buffing, raw materials packing etc. gaseous emissions were observed by the researcher but no one respondents.

It is observed that the quality of water deteriorates significantly after the discharge of industrial effluents into the river. Chrome tanning is the most common type of tanning where maximum amount of chromium is used. The tannery is used different chemicals in tanning process. In a tanneries more than 50 types of chemicals are used. At the end of leather processing those chemicals are washed. After washing these chemicals it turn into different colors. The waste comes out the tannery and runs through the drain and goes into the river and nearby ponds. The waste contain high amount of chemicals and for this reason the wastes are of many colors. So it

showed that the maximum type of waste color is black. The blackish color tannery waste which discharged from the tannery. In the survey it was found that large number of chemical is absorbed by leather others turn to the waste.

Pollution of environment is one of the most horrible ecological crisis to which we are subjected today. About 55% of the tannery industries have been built in unplanned way at the congested places. These unplanned tanneries caused environmental pollution very much. It was showed that the most harmful environmental effect was bad smell to the surrounding areas which caused environmental pollution.

Huge amounts of chemicals flow off the tannery floor, into open gutters in those areas streets, which are the mainly associated with Palar River. Most of the workers in the tanneries of Vellore District were suffer from gastrointestinal, dermatological, and other diseases. The presence of arsenic in the ground water increasing scarcity of fresh drinking water which causes skin lesion, kidney, liver complication, cancer etc and most of the employees suffer from skin diseases. The tannery labors did not wear any gloves, apron and special shoes rather than they work in bare feet. The tannery wastes were disposed in unplanned way. These wastes covered the surrounding area which creates foul smelling and the foul smelling environment damaged human health.

CONCLUSION

From this study, the researcher comes to the conclusion that The most environmental effect was bad smell to the surrounding area, and the scarcity of fresh water. Different types of health problems occurred in the study area according to observation. A large number of common public had low environmental pollution awareness where some of the general public had no knowledge in environmental pollution. In the study it is demonstrated that mostly all the stages of tannery processing, individually and collectively impacts negatively to the environment. Results revealed that tanning industry wastes poses serious environmental impact on air, water and soil pollution, human disease Finally, it could be said that adequate preventive measures should be taken in tannery industrial activities with a view to ensuring safe, sound and healthy environment for greater benefit.

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42. FUNDAMENTALS OF POWER GENERATION

Dr. SUNDARA M. KAVIDASS, Thermal Power Generation Expert, Managing Director, SP Energy Tek (Alliance Partner With McHale, USA), Newton circle, West Grove PA 19390, USA.

INTRODUCTION

The objective of this fundamentals of power generation article is to create an awareness of various method of power generation to students. This paper aims to highlight proven technologies that are being used worldwide.

ENERGY CAN EXIST IN VARIOUS FORMS

Radiation energy: The radiation from the sun contains energy, and so does the radiation from a light or a fire. More solar energy is available when the radiation is more intense and when it is collected over a larger area. Light is the visible part of radiation.

Chemical energy: Wood and oil contain energy in a chemical form. The same is true for all other materials that can burn. The larger the content of chemical energy, the larger the heating value (calorific value) of the material is and, of course, the more material we have. Also, animate energy (delivered by bodies of human beings and animals) is, in essence, chemical energy. Furthermore, batteries contain chemical energy.

Potential energy: This is the energy possessed by an object because of its position relative to other objects. For example, the energy of water stored in a reservoir at a certain height. The water has the potential to fall, and therefore contains a certain amount of energy. More potential energy is available when there is more water and when it is at a higher height.

Kinetic energy: This is the energy an object possesses due to its movement, as in wind or in a water stream. The faster the stream flows and the more water it has, the more energy it can deliver. Similarly, more wind energy is available at higher windspeeds, and more of it can be tapped by bigger windmill rotors.

Thermal energy or heat: This is the energy that is generated and measured by heat. Heat in turn is indicated by temperature. The higher the temperature, the more energy is present in the form of heat.

Mechanical energy or rotational energy: Also called shaft power, this is the energy of a rotating shaft. The amount of energy available depends on the flywheel of the shaft, i.e. on the power which makes the shaft rotate.

Electrical energy: This is the energy made available in the form of electricity or electric power. A dynamo (generator) and a battery can deliver electrical energy. Electrical energy is supplied by the combination of electric voltage and current. The higher the voltage and the current, the more electrical energy is made available.

Before getting into the different types of power generation, it is important to understand about the two different types of Energy resources – Renewable and Non-Renewable.

RENEWABLE ENERGY RESOURCES

Renewable energies generate power using natural sources that can be replaced over a relatively long time frame. Examples of renewable energies include solar, wind, hydro, geothermal and biomass.

Advantages: Because renewable energies are not burned like fossil fuels, they do not release pollutants into the atmosphere and provide a cleaner, healthier environment. Sources of renewable energy are found everywhere in the world and are not fully utilized.

Disadvantages: Initial costs for setting up renewable energy plants are often quite high and require careful planning and implementation. Building dams, for example, for hydroelectric power requires high initial capital and relocating villages is a major challenges. Renewable energies like solar and wind require large tracts of land to produce energy quantities competitive with fossil fuel burning. Renewable sources of energy generation are also affected by weather, reducing their availability. For example, wind turbines only rotate it there is enough wind at a given speed.

NON-RENEWABLE ENERGY RESOURCES

Non-renewable energies come from resources that are not replaced or are replaced only very slowly by natural processes. The primary sources for nonrenewable energies in the world are fossil fuels -- coal, gas and oil. Nuclear energy is also considered nonrenewable because there is a limited availability of thorium or uranium in the Earth's crust.

Advantages: Fossil fuels are the world's traditional energy sources and electrical power plants, vehicles and various industrial plants are built around using them. Many nonrenewable energies are more reliable than most renewables and are not subject to weather conditions. They provide continuous 24 x7 dependent energy.

Disadvantages: Fossil fuels are in a limited supply and one day it will be depleted. Processes

releases harmful greenhouse gases into the atmosphere, primarily CO2. Nuclear power plants do not release CO2, but pose other risks such as potential radiation leaks and waste storage problems. The costs for building new nuclear power plants have also risen sharply making them less economical than other types of power.

TYPES OF POWER GENERATION

The traditional proven forms of power generation that are being utilized today are listed below:

→ Thermal power generation
→ Nuclear Power generation
→ Hydro Power generation
→ Solar Power generation
→ Wind power generation

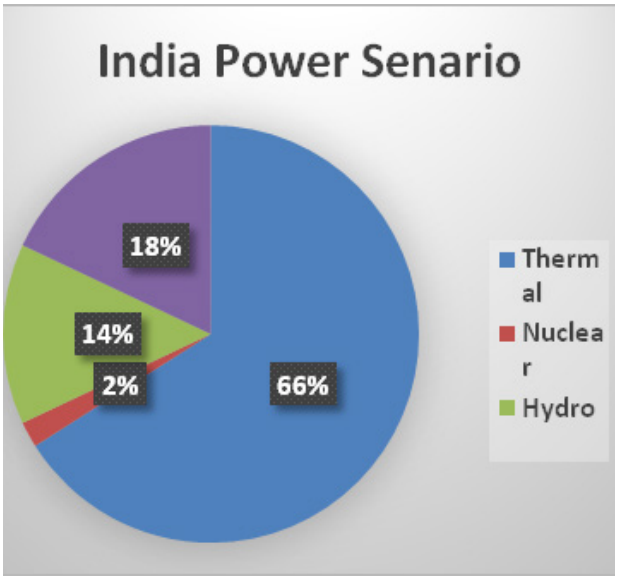


Figure -1 India Installed Power

Thermal Power Generation

A thermal power station is a power station in which heat energy isconverted to electric power. High pressure water is heated by a boiler and turned to steam. The boiler uses Coal, Oil or Gas as fuel to heat the water. During combustion in the boiler or steam generator, the heat is exothermicallyreleased and high pressure water absorbs the heat and converts into high pressure steam. The boiler efficiency is typically 85-90%.

The high pressure steam is used to spin a steam turbine. Thesteam turbine is a mechanical device that extracts thermal energy from high pressuresteam and converts it tomechanical work on a rotating output shaft. The efficiency of the steam turbine is 50-55%. The steam turbine is coupled to an Electrical generator, which converts mechanical energy obtained from the steam turbine into electricity. The generator uses the turning motion of the turbine shaft to rotate a rotor which has oppositely charge magnets and is surrounded by copper wire loops. Electromagnetic induction is created by the rotor spinning around the inside of the core, generating electricity.

After the steam passes through the steam turbine, the steam is condensed in a condenser and recycled to where it was heated (Boiler). This cycle is known as a Rankine cycle (see below).

Chemical Energy (Coal,Oil &Gas)- -Heat Energy (Steam Generator)-Mechanical Energy (Steam turbine)---Electrical Energy (Generator)

The electricity generated is transmitted for long distances via high voltage transmission lines. The transmission lines branch of into sub-stations where the voltages are stepped down via transformers and fed via low voltage transmission lines to consumers.

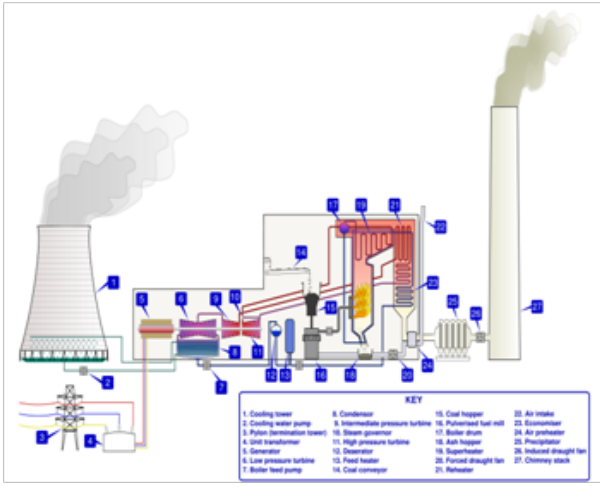


Figure - 2 A Typical Thermal Power Plant

A typical thermal power plant picture can be seen in Figure - 2.The overall power plant cycle efficiency ranges from 35-48%. The capital cost of the thermal power plant is Rs 4-6 Crores/ MW. India's thermal power installed capacity is 66% (218,960 MW) as shown in Figure - 1. This is partly due to the abundance of coal/lignite in India. Some of the gaseous by products of burning coal/lignite are Carbon dioxide (CO2), Sulphur dioxide (SO2) and Nitrogen dioxide (NO2). Technologies have been put in place at Thermal Power plants to minimize if not eliminate the release of these gases into the atmosphere.

CO2 is one of the greenhouse gases that protect the earth by keeping it warmer than normal. But, a continuous increase in the amount of greenhouse gases would lead to an increase in the earth's surface temperature, leading to global warming and climate change. This huge

concern has slowly started to shift the tide from generating electricity from Thermal Power plants to other renewable means (Hydro, Solar and Wind).

NUCLEAR POWER GENERATION

Nuclear poweruses nuclear energy to generate heat as opposed to coal/oil/gas in Thermal power. Nuclear energy originates from the splitting of enriched uranium atoms – a process called fission(refer to Figure-3).

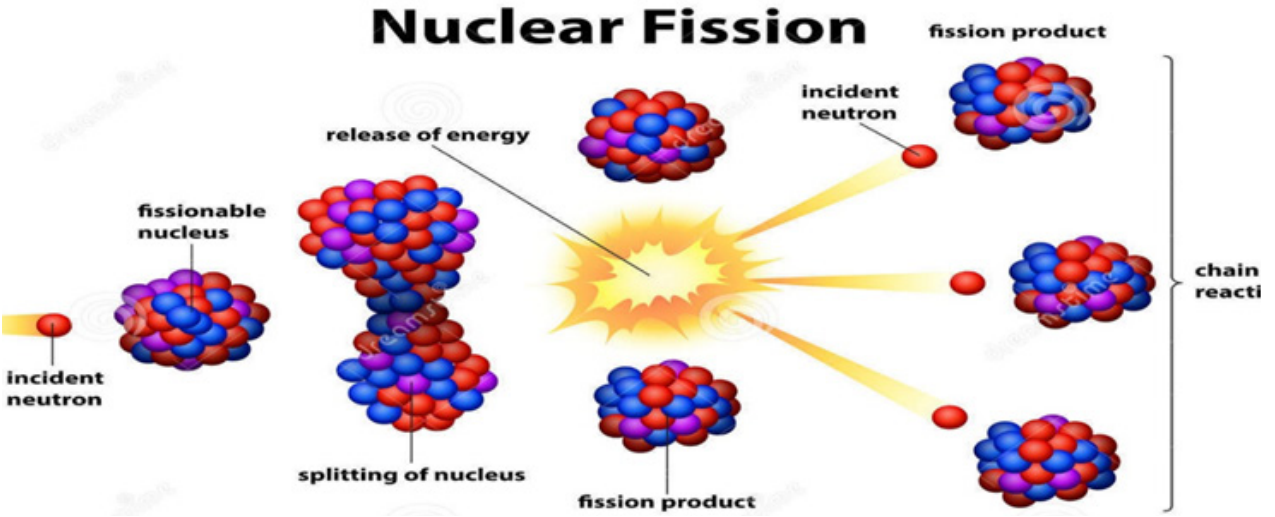


Figure -3 Nuclear Fission – Using Enriched Uranium

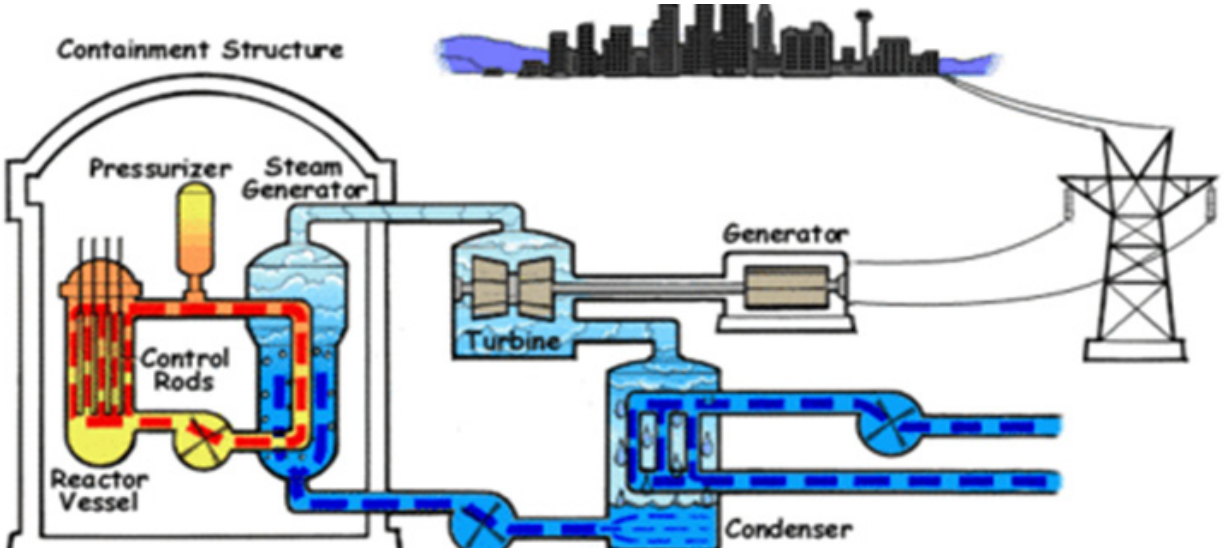


Figure - 4 A Typical Nuclear Power Plant

The nuclear reactor vessel is the heart of the Nuclear power station (refer to Figure-4). In its central part, the reactor core is heated up by controlled nuclear fission with uranium rods. With this heat, a coolant (typically heavy water) is heated as it is pumped through the reactor. The heavy water absorbs the heat from the reactor and is converted to high pressure steam. Similar to a Thermal power plant, the high pressure steam is used to spin a turbine generator, which in turn produces electricity.

Nuclear power installed capacity in India is about 2% (6,780 MW). Becausenuclear power plants do not burn fuel, they do not produce any greenhouse gas emissions. Nuclear power is considered to be reliable. However, because of the excessive safety requirements, the capital costs to build a Nuclear power plant are very high (Rs. 15-20 Crores/MW).

Availability of enriched uranium is limited in India, safe nuclear waste disposal is a major challenge and concerns about safety continue to make Nuclear power a less popular choice.

HYDRO POWER GENERATION

Hydropower is a form of renewable energy. Water stored in a damfalls by gravity through a tube called penstock and is used to spin water turbines located below the dam (refer to Figure-5). The potential energy of standing water is converted to kinetic energy by moving it, then converted to mechanical energy by

spinning a turbine.The turbine is coupled to a generator, which produces electricity.

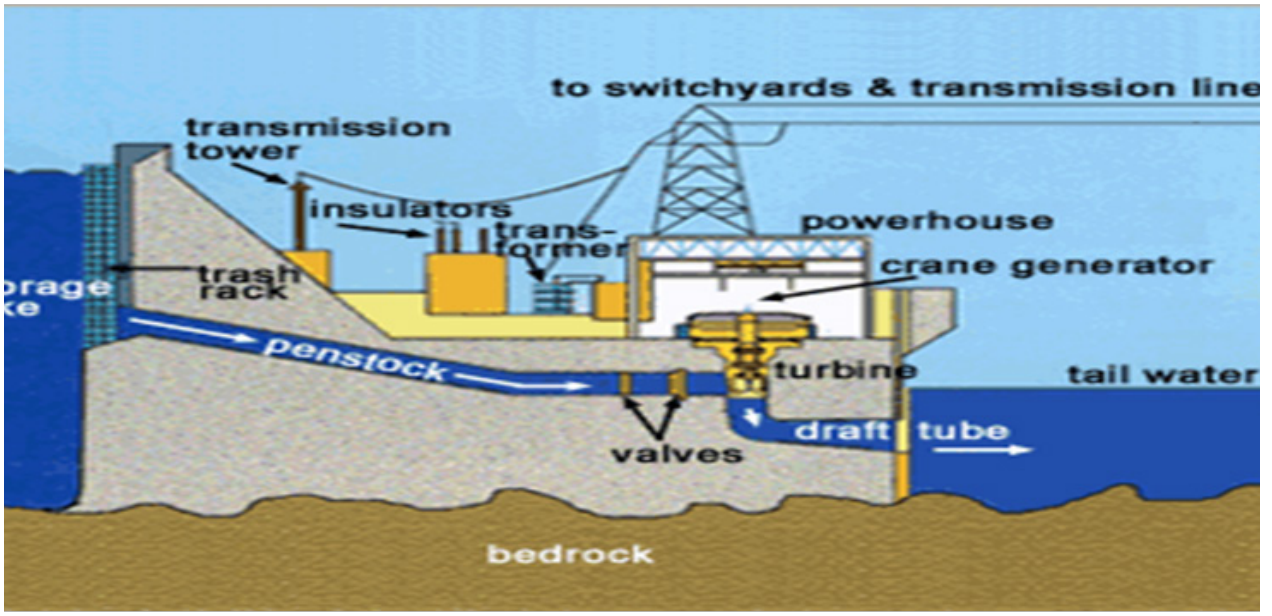


Figure -5 Hydropower Generating Plant

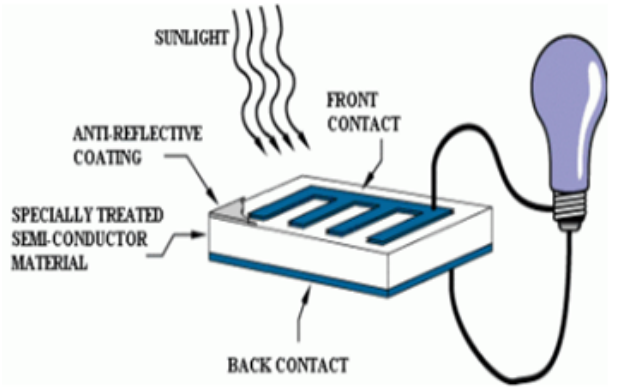
Hydropower does not use any fuel andis environmentally clean. Because of its predictable power output and quick startup times, Hydropower is typically used for catering peak electricity demand.

Due to the vast land area required, the capital cost is Rs 8-10 Crores / MW. The generating cost is about 1/4th of thermal power. Rehabilitation of surrounding landis a major issue. The dam is monsoon dependent and seasonally affected. Hydropower installed capacity in India is about 14% (44,963 MW)

SOLAR POWER GENERATION

Solar power is the conversion of energy from sunlight into electricity using Photovoltaic (PV) cells.

PV cells or Solar cells work by a phenomenon called Photoelectric effect. PV cells use a semiconductor (material that partially acts as a conductor and an insulator). The semiconductor material is specially treated to form an electric field i.e. positive on one side and negative on the other (refer Figure-6 Photovoltaic Cell)



When light energy from the sun or photons strike the solar cell, electrons are knocked loose from the atoms in the semiconductor material. These electrons are captured in the form of electric current by electrical conductors attached to the positive and negative side of the solar cell. The electricity generated from a solar cell is Direct Current (DC). Since most appliances used in homes and businesses are powered by Alternating current (AC), an inverter is used to convert DC to AC (referFigure-7).

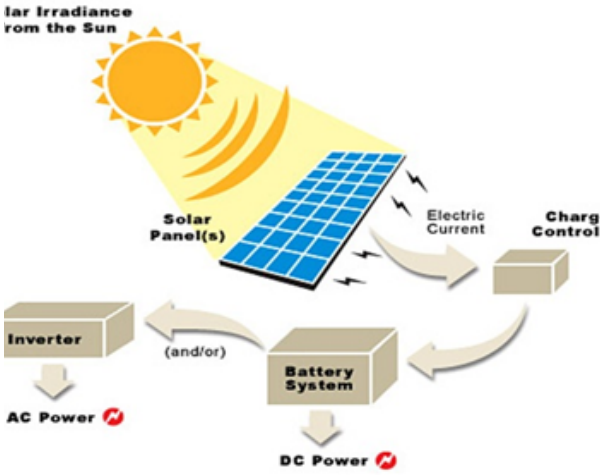


Figure -7 Solar Power Generation

Solar energy can be used to produce electricity in areas without access to the energy grid, to distill water in regions with limited clean water supplies and to power satellites in space.

Some advantages of Solar energy are reduced electricity generating costs because of no fuel cost, can be utilized for diverse applications (power homes or buildings, hot water), low maintenance cost and virtually no greenhouse gases emissions. Solar energy is also available

in abundance.
Disadvantages are require larger land area (4-5 Acres/MW), only available during day time, power generation is poor during winter / cloudy period and relatively higher capital cost (Rs 6.0 to 7.0 Crores / MW). Currently,solar power can be generated 30-33%percent per annum.

WIND POWER GENERATION

Wind Power is the conversion of Wind energy into electricity. The energy in the wind turns two or three propeller-like blades in a windmill or wind turbine. The blades are connected to a central shaft. The shaft is connected to a gearbox, which in turn is coupled to a generator that produces electricity. The kinetic energy of the wind is converted to mechanical energy and used to rotate the blades and shaft rotor. The mechanical energy of the shaft is converted into electric energy by using a generator.
There are two different types of wind turbines – Horizontal Axis Wind Turbine, where the blades rotate on a horizontal axis and Vertical Axis Wind Turbine (commonly used), where the blades rotate on the vertical axis.
Thegearbox is typically used in a wind turbine to increase rotational speed from a lowerspeedto a higher speed. A common ratio is about 90:1, with a rate of 16.7 rpm input from the rotor to 1,500 rpm output for the generator.The output of a wind turbine depends on the turbine's size and the wind's speed through the rotor.

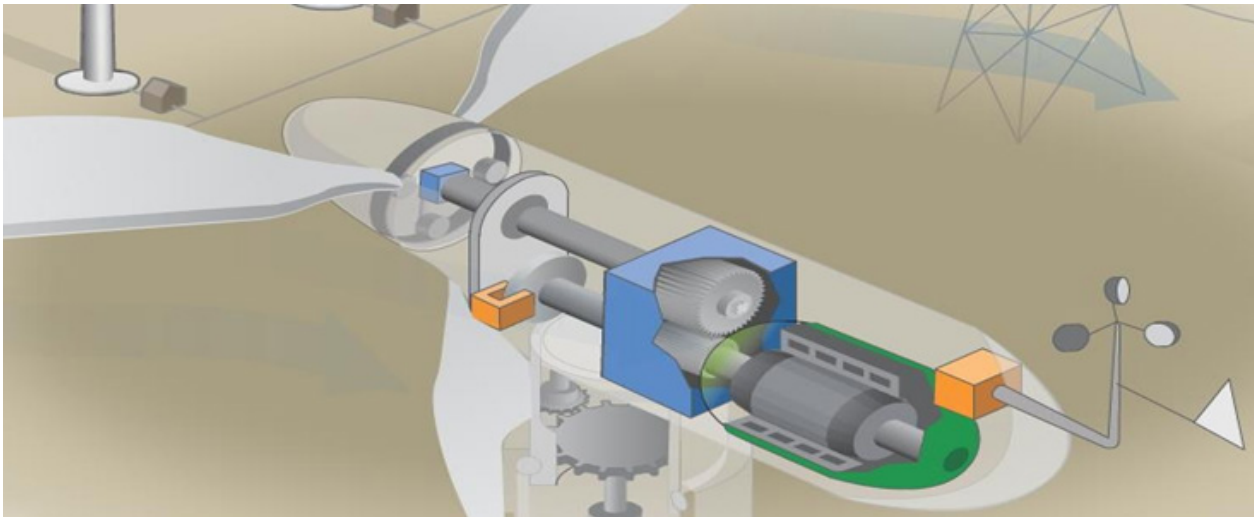


Figure 7 – Wind Turbine Cross Section

Wind energyis a clean fuel source and doesn't pollute the air like power plants that rely on combustion of fossil fuels, such as coal, oil or natural gasWind is available free of cost and require small land area.
An average onshore wind turbine has a capacity of 2.5–3 MW.The capital cost is slightly higher than thermal power plants but much lower than a solar power plant. A typical capital cost ranges between Rs. 7 - 8 Crores / MW, depending up on the type of turbine, technology, size and location. The total wind installed capacity in Tamil Nadu is 7633 MW (Highest installed capacity) with about a 15% capacity utilization factor.
Some of the disadvantages of Wind turbinesare higher noise and larger land area required to install them.Wind turbinesare also considered a potential threat to wildlife such as birds and bats.

CONCLUSION

It is essential that students understand the different types of energies and fundamentals of power generation including the advantages and disadvantages of the same.The author's intention is to provide an overview of the above to help the reader to better understand and learn the fundamentals of power generation.
The author is taking an opportunity to thank Mr. R. Madhan, Manager, Stock Equipment, USA for supporting this paper.

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43. TACKLING FORMIDABLE INDUSTRIAL POLLUTION BY SOPHISTICATED AND ECO- FRIENDLY TECHNOLOGY

ABOOBACKER SADIQ E, Graduate student at department of political science, Calicut University, absadiqe@gmail.com.

ABSTRACT

The contemporary environmental awareness has emerged primarily from the concerns in the late 19th century about protection of the countryside in Europe and the wilderness in the United States and also from the health-issues ensuing the pollution during historic industrial revolution, took place in Britain in the 18th century. Its profound aftermaths such as climate change, urbanization, pollution and over-mining, etc. are challenging even the human existence, although there are certain benefits. It is no exaggeration to say that pollution will be a biggest cause of premature death since the estimations conclude that by 2050 there will be about 3.6 million deaths a year, most of them in China and India (OECD report). Although world leaders' perpetual attention and solidarity on this topic, for instance the Paris agreement on 30 November 2015 on climate change, are more commendable, it has fallen by the wayside.

In this research-initiative my paper would illustrate the use of sophisticated and eco-friendly technology to tackle the formidable challenges of industrial pollution. As the industrial activities are essential for an economy, citizens' well-being and maintenance of employment, its complete elimination is practically beyond the bounds of possibility. Hence, one of the key methods for getting rid of these challenges in the advanced world can be attained through the technological development.

My study focuses on industrial pollution and the use of advanced technologies, introduced as new industrial process or modification of existing one for reducing the impacts of the production on environment, such as accumulation of wastes, air pollution, water pollution and noise pollution, etc.

KEYWORDS: premature death, urbanization, sophisticated technology and modification,

INTRODUCTION

It is virtually a truism that for several centuries, the environment has provided fit habitation for human being and numerous organisms in the face of considerable challenges. But, the last few decades the environment has been perpetually enduring excruciating pain by the insatiable appetites of humans. The major global ecological crises confronting the planet at present are climate change, deforestation, land contamination and extinction of species of flora and fauna, etc. Many of these are formidable aftermaths of industrial revolution, the rapid development of industry that occurred in Britain in the late 18th and 19th centuries, brought about by the introduction of machinery. Subsequently, profit-making attitude of man excessively exacerbated and aggravated the limited natural resources. No one doubts that the intimidating Environmental challenges are serious threats to even the human existence.

The history of scientific awareness on environmental dates back to 1960s or even before, which was then followed by an intense socio-political awakening. Hence, Environmental degradation and climate change have been an important cornerstone of the global policies since a nation's environment is not its own but is shared with its neighbors and the rest of the world. Recent UN Climate Change Conference in Bonna, Germany on November and former Paris convocation on climate change in 2015 are historic watershed in the 21stcentury.

Out of these, climate change is a global environmental problem which has been catching intense political attention both at domestic and international levels. The united Nation Framework Convention on Climate Change(UNFCCC) defines 'climate change' as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. As increase in carbon dioxide concentration in the atmosphere is the prime cause of climate change, reduction in emission of this gas and its sequestration from atmosphere are the prime requirements for reducing climate change driven threats.

At present, industrial pollution constitutes major portion of causes of environmental degradation in general and climate change in particular. As industrial activities have played decisive role in advancement of human civilization, there is absolutely no doubt that the feasibility of environmental protection will be hardly ever accomplished without industrial process. Hence, there is no alternative but to fortify ramparts of sustainable development. A set of sustainable goals released by the United Nations in 2015 as

as a successor to the Millennium Developing Goals Officially known as 'Transforming our World: the 2030 Agenda for Sustainable Development', are hearty commendable.

In this advanced world, as everything is more convenient and accessible due to advances in technology across almost all sectors, clean and eco-friendly technologies are better preventive mechanism. Many countries made remarkable progress in recent decades in virtually all industrial sectors in terms of ecological efficiency of production processes by sophisticated technologies.

INDUSTRIAL POLLUTION: A BRIEF HISTORY

While the Industrial Revolution meant that more goods could be produced for human consumption, it also meant that more pollution would be emitted into the sky and more natural resources would have to be exploited in the production process. Although pollution of major proportions has been a problem since the centuries preceding the middle ages, it is worth noting that after World War II, the type of pollution involved changed significantly with introduction of nuclear weapons.

In February 1950, a discussion on problems of nuclear energy was held, where Einstein said that the idea of national security through nuclear weapons was "a dangerous illusion." He also said that "radioactive poisoning of the atmosphere and hence annihilation of any life on earth has been brought within the range of technical possibilities." The only way out of the situation, Einstein said, is "a supra-national judicial and executive body" and "a declaration of nations to collaborate loyally in the realization of such a restricted world government." In 1952, with the break out of 'The Great Smog', which had caused 6,000 deaths within a year due to respiratory diseases, the Clean Air Acts of 1956 and 1968 were formulated. The smog was formed due to burning of coal in production processes. The awareness regarding the situation went on increasing around the 1970's, but the problem by then had taken a dangerous shape. Along with progress in production sectors and industry, the temperature of the earth has also been increasing. But faulty process designs and the greed for more production despite the environmental hazard are still going on. Some countries have formulated laws and regulations regarding the production process in order to ensure clean and safe environment, but when it comes to implementation most of the countries have failed in fulfilling their duties. The following timeline reflects on the history of Carbon dioxide emissions:

INDUSTRIAL POLLUTION AND CLIMATE CHANGE IN INDIA: INSIDIOUS LINKAGE

In this climate and pollution challenged world, public health is at serious risk from the ominous trends in toxic industrial pollutants and warming gases. industrial pollutants are under scientific scrutiny not only for what they do to our body and health, but also how they enhance climate impacts and associated health risks. Science does not allow us to keep the local public health impacts of industrial pollution and the global warming impacts of green house gases in silos anymore. The emerging science has given us more reasons to be worried about industrial pollution. This demands an integrated framework for mitigation to minimize public health risk.

The speed with which industrial pollution is growing across India is alarming. Close to half of cities are reeling under severe particulate pollution while newer pollutants like nitrogen oxides, ozone and- air toxics are worsening the public health challenge. As many as 95 per cent of Indians across the country breathe air quality that is worse than the WHO's recommended standards. The worrying trend is the proliferation of new hot spots every year. Smaller and more obscure cities are amongst the most polluted in the country. Some mega cities that have initiated some pollution control action in the recent years, have witnessed either stabilization or some lessening of the high levels. But several cities like Delhi, even after the initial stabilization are finding it difficult to sustain their air quality gains and are in the pincer grip of serious multi-pollutant crisis. It is worrying that even after decades of air quality management, particulate air pollution has remained among the top 10 killers globally with disproportionately high health impacts in the developing world. The recent global burden of disease (GBD) estimates shows that in India alone, more than 627,000 people die prematurely and 18 million healthy life years are lost every year due to ill health connected especially with the tiny particles. There are now myriad studies across the world and also in India to prove that outdoor urban air pollution is a serious environmental risk factor that causes or aggravates acute and chronic diseases. Also, given the latency period of toxic risk, Indian cities are likely to see more cancers due to increase in environmental health risk. This makes a strong

case for control of air pollution. Health criteria need to be built into the air pollution control policies more clearly.

Polluted air has also compromised the health of our future generations in cities like Delhi. Considerable evidence has come from the epidemiological study on children in Delhi carried out by CPCB and Chittaranjan National Cancer Institute in Kolkata and published in 2012. This study had covered 11,628 school-going children from 36 schools in different parts of Delhi and in different seasons. Every third child had reduced lung function. There is a marked increase in the number of bio-markers like alveolar macrophages (the first line of cellular defense against inhaled pollutants) in the sputum of children. This shows greater exposure to particulate pollution. Sputum Air Pollution and Climate Impacts: Demystifying Link of children in Delhi contains four times more iron-laden macrophages than those from cleaner environs, indicating pulmonary haemorrhage. The study found the level of these bio markers higher in children from areas with high particulate levels.

Studies are dominated by the focus on respiratory symptoms. But in the recent years, they have begun to include more diverse health end points – cardiac cases, cancer, mutagenic effects, etc. Though this investigation in India is still very nascent, global studies have made more robust linkages with a wide range of health endpoints – diabetes, stroke, hyper tension, effects on brain, effects on foetus etc. Given the fact that endpoint of all toxic risk is cancer, all environmental risk factors should be minimized. This is particularly serious in India that reports overall over 700,000 new cancer cases and National Cancer Control Programme (NCCP) forecast that by 2026, more than 1.4 million people will be falling in the grip of the disease. NCCP has listed greater exposure to environmental carcinogens as one of the most important reasons. The mitigation strategy must reduce environmental risk from all factors – and air pollution is an important factor. Numerous studies in the West assessed the causes such as genetic susceptibility, environment factors and lifestyle. This trend in public health risk is expected to get worse if the pollution trends remain business as usual and the global warming impacts get further enhanced.

TERRIBLE EFFECTS OF INDUSTRIAL POLLUTION

Global Warming: Global warming is among the most serious outcome of industrial pollution, witnessed on the account of the steady rise of industrial activities. Industries release into the atmosphere a variety of greenhouse gases including carbon dioxide (CO2) and methane (CH4). These gases absorb thermal radiation from the sun thereby increasing the general temperature of the earth, leading to global warming. It has several severe effects on human health and the environment. Rise in water levels, melting of glaciers, extinction of polar species, tsunamis, flooding, and hurricanes are some of the dire effects of global warming. Furthermore, global warming has threatened human survival and presented health risks such as the increased incidences of diseases like cholera, plague, malaria, Lyme disease and so on.

Water Pollution: Pollutants discharged from the industries have widespread implications, and one of the unpleasant effects is on water bodies. Industries demand lots of water for efficient production such as cooling, cleaning, and treatment and as such, the water drawn from the water sources is never the same after use. Inappropriate contamination of used water and the discharge of different waste water into water sources often result in water pollution. In most cases, the water is contaminated with dangerous chemicals, radioactive materials, heavy metals or organic sludge. For this reason, dumping of the wastewater directly into waterways or oceans negatively impacts on marine life, humans, and the environment on various aspects.

Air Pollution: Based on the increased counts of factories and manufacturing processes, both large and small scale, gaseous emissions have continued to compound. This makes industrial pollution one of main Causes of air pollution. The emissions from different industries contain gaseous contaminants such as sulfur, carbon dioxide (CO2), oxides of nitrogen, methane, and so on. These gases, when too much in the atmosphere, frequently results in several illnesses and environmental hazards. Formation of acid rains, the presence of smog, and heightened incidences of respiratory disorders among humans are some of the implications of air pollution.

Soil Pollution: Soil pollution occurs when the soil loses its fertility and structure owing to diverse natural and artificial phenomenon. Disposal of industrial wastes into landfills is among the artificial aspects contributing towards soil pollution. Industrial wastes have in them varied amounts of toxic materials and chemicals such that when deposited in landfills, it accumulates in the top soil thereby depreciating the fertility and biological activity of the soil due to soil poisoning. Such implications eventually

contribute to ecological imbalances thus creating problems in crop productivity. Apart from that, the chemicals and toxic materials in poisoned soils accumulate in plants grown in such areas causing health problems to those who consume such crops.

Effect on Human Health: The world Health Organization (WHO) revealed that outdoor air pollution accounts for about 2% of all lung and heart diseases. WHO also underscores, around 5% of all lung cancers and 1% of all chest infections are implications outdoor air pollution. In brief, these statistics indicate just how industrial air pollution depreciates human health. For instance, one of the worst industrial disasters of all times that took place in Bhopal, India, in 1984 claimed the lives of more than 8,000 people and the effects were still being felt more than two decades later. This means, industrial air pollution may not manifest immediately but takes several years.

Industrial toxic and chemical wastes that are disposed into water bodies or landfills are also responsible for cancers and human cell poisoning. For instance, exposure to inorganic arsenic causes tumors to form. Above all, industrial pollutants are responsible for thousands of illnesses and premature deaths across the globe.

Wildlife Extinction: The tendency of industrial and manufacturing processes that constantly demands production resources and repeated exploitation of raw materials has cumulatively led to the destruction of forests and the natural habitats that support wildlife. Acts such as mining, deforestation, and utilization of water resources for industrial production have destroyed natural habitats and forced organisms to move further into the wild, exposing them to predators and intolerable living conditions. Consequently, some wildlife species have faced extinction while several others remain highly endangered. Industrial wastes,

Chemicals, emissions, or accidental leaks, fires, oil spills and so on, have also been prime contributors to wildlife extinction. Furthermore, these environmentally damaging materials take several years to clean-up thereby compounding the effects. For example, the BP oil accidental spill in 2012 claimed thousands of marine life, and some of them were among the rarest species on earth. Even after some time had passed, marine animals continued to die.

ECO-FRIENDLY TECHNOLOGY AS A PREVANTIVE MECHANISM

There is absolutely no doubt that injecting the awareness on impacts of environmental degradation is proper method to protect environment. However, in this advanced world, clean technologies can play decisive role in reducing industrial pollution. Many countries have introduced eco-friendly technologies in industrial process. The following technologies are from different countries:

Semiconductor industry: innovation moves ahead:

About 30% of the operations involved in manufacturing semiconductors consist of cleaning silicon wafers by means of large quantities of aggressive chemical solutions such as sulphuric acid. This is harmful to the environment, to which must be added the high costs involved, in particular because of the considerable quantities of de-ionized water (DI) needed. One of the main applications of the process is photoresist stripping. The Interuniversity Microelectronics Center (IMEC), a Flemish association which has become one of the world's leading independent microelectronics research centers, has developed an original alternative to photoresist strip-ping in partnership with a private German company of the Texas Instruments group.

The new technique combines the use of ozone (O3) with a DI boundary layer controlled process at the wafer surface. Its superiority over the conventional O3/DI technique is due to a stronger concentration of reactive ozone near the surface. The IMEC process avoids the use of sulphuric acid and reduces de-ionized water consumption by 90%. For a medium-sized company, this is tantamount to savings of 2 200 litres of sulphuric acid and 500 000 litres of DI water a week. The possible integration of the requisite hardware in existing equipment, moreover, limits the investment required.

The process has initially been incorporated in IMEC's semi-industrial production line before moving on to full-scale integrated circuit production units of Texas Instruments in Freising (Germany). The many changes made to the conventional system include the installation of an ozone generator. Because of the safety problem of releasing a large quantity of this gas into the air, initial experiments were carried out with an ozone-destroying catalyst conversion system, which has in the meantime been replaced by a thermal system operating at 90% efficiency. Experimenting with such systems under conditions of high steam concentrations in the exhaust circuit has been a "first" in this domain. Moreover, a secured ozone detector ensures protection of workers.

Ecology and margarine: they are compatible:

Manufacturing margarine normally generates considerable amounts of polluting waste.

Refining fats by means of sodium hydroxide leads to the formation of sodium soap which has to be eliminated by rinsing and through treatment with chlorohydric acid. This leads to large quantities of highly polluting waste water which has to be purified. The hardening of oil sand fats through hydrogenation involves hydrogen emission into the air. Emulsifiers and other chemical additives complete this brief overview.

Lasem Alimentación1used to apply these processes themselves until they decided to switch to sustainable growth and to develop a line of eco-logical products. They received LIFE funding for their project to produce ecological margarine manufactured with raw materials which were likewise ecological, using only clean technology without any chemical treatment and without generating any solid or liquid waste or pollutant emission.

Fats are refined in a physical process under vacuum at high temperature. After mixing, natural coloring and flavoring agents are added and the mixture is emulsified with water. The emulsion is then subjected to crystallization and crystal maturation and stabilization, followed by plasticization (high-pressure cooling). Hydrogenation and a number of other stages are eliminated. The new equipment used wards off risks of contamination and facilitates cleaning.

The raw materials used are coconut fat from coconut palms abundantly growing in the wild in the Philippines. One difficulty is to secure a regular supply of a product from untreated trees, extracted without solvents. Another raw material is sunflower oil which is available in Spain where the plants are cultivated without chemical treatment. In spite of the higher cost of the raw materials, the process consumes less energy and obviates the need for high expenditure on water purification and sludge treatment. It benefits from sound opportunities on a market which is increasingly open to ecological products. Highly innovative, this LIFE project also applies strategic planning which may be of interest to other agrifood producers and other industrial sectors.

Cleaner digital printing in the textile industry: In the Italian province of Como, printing on silk is a centuries-old tradition. However, it has inevitably had an impact on the environment, with large quantities of waste coloring agents and rinsing water, high energy consumption for drying, and noise. The LIFE Tie print project arose from the idea of combining this tradition and modern digital printing techniques to reduce these drawbacks and the costs involved. For this purpose, an SME, Stamperia di Lipomo, formed a partnership with other local companies and with the Associazione Impresa Politecnico, which is specialized in management of new technology. Digital printing on fabric had been regarded as applicable only to small samples and had not moved beyond the experimental stage. With this LIFE project, the aim was to work out an innovative technique which could ensure regular production in a varied range of fabrics, responding to the growing interest in the textile sector among computer equipment manufacturers and software producers. After taking stock of the activities, costs and resources of the three companies, benchmarking digital ink jet printing techniques and trials with the model chosen (ENCAD/SOPHIS), the next step was to improve performance. For instance, the use of a spectrophotometer makes it possible to determine parameters on the basis of a fabric sample submitted by a customer and then print in the same colors, with savings in time, dye and energy. The results are highly illustrative: dye savings because of a 100% reduction in excess dyestuff, 60% reduction of waste water, 80% savings of thermal energy and 30% savings of electricity, 60% noise reduction and 60% reduction of production space required, and an overall reduction of costs. In addition to these benefits for the environment, there has been a major improvement in working conditions, with positive socio-economic effects. A challenge for the future is to ensure continuity of this activity and success in marketing the products.

Manufacture of diodes: less molybdenum along the Danube: At its ultramodern Vöcklabruck site, one of the major production units in terms of volume and quality, the Vishay Semiconductor Austria Company, which forms part of the VishayIntertechnology Inc. group, manufactures about 200 million diodes a year. The diodes are used as fast rectifiers in a wide range of applications in the electronics industry, e.g. in switching circuits, fluorescent tubes, computers, monitors and TV sets and as electronic components in cars.

Production of the diodes involves the use of sintered molybdenum (Mo) pins. Before being used in the production process, the oxide film has to be removed from these pins. In the past, they had to be etched with nitric, sulphuric and hydrochloric acid for this purpose and then rinsed with water. The result was a very high concentration of Mo in the waste water discharged into the Vöckla River which eventually flowed into the Danube.

Both because of its desire to protect the environment and on account of new environmental legislation in Austria, Vishay has with LIFE funding developed a project

based on the industrial application of an entirely new technology to remove the oxide film through a mechanical process, barrel polishing, which acts through friction. A new soldering technique to assemble components has been introduced and a new soldering oven with a high precision control system has been installed. The result of the LIFE project has been a drastic reduction of molybdenum in waste water: 0.6 mg/l instead of 18 mg/l at full production capacity. The residual rate is due to the fact that a brief leeching stage is still necessary in producing the pins. In addition to this remarkable result, which also benefits other countries along the Danube, there have been substantial reductions in costs: lower cost of waste water treatment, less acid used and fewer diode rejects. The new process is easily transferable, and a second diode production line has been established at another Vishay production site, in Gyöngyös (Hungary).

Steel goes green - A cleaner steel industry thanks to electrodialysis: The AvestaPolarit steel plant of Nyby/ Torshälla is difficult to find surrounded by nature and located some 100 kilometers west of Stockholm, not far from the attractive town of Eskilstuna which is renowned for its old forges. This comes as a surprise in particular to people who believe that steel production is inevitably associated with smoky industrial areas. But this is Sweden, a country with vast spaces where great care is taken to ensure that factories fit in with the landscape and the environment. At Nyby/ Torshälla, high trees surround the site, largely screening off the steel works. The Nyby plant is specialized in cold rolling of flat stainless steel products. The blast furnaces and hot rolling mills are installed at Avesta, 120 km to the north. Steel coils are transported by train or lorry from Avesta to Nyby where they are cold rolled into high-grade stainless steel. Every week the plant produces 3 500 tonnes of stainless steel, 70% of which is exported. It is used for plating high-speed trains, cladding buildings and telephone booths and to manufacture food equipment in accordance with European standards.

CONCLUSION

The objective of the paper was to present the views on industrial pollution and its prevention by technologies have been widely accepted in the world. On any contentious issue, it is impossible to have 100% acceptance. No doubt, there are differing views on these dual issues. Each differing view has to be evaluated on its own merits.

It appears that polluted environment is global issue and world community would bear worst results more as they already faced. In this advanced world, it is revealed that as everything is more convenient and accessible due to advances in technology across almost all sectors, clean and eco-friendly technologies are better preventive mechanism. Many countries made remarkable progress in recent decades in virtually all industrial sectors in terms of ecological efficiency of production processes by sophisticated technologies. It is offers better environmental world that the dissemination of clean technologies among countries and the launching of new technologies by world wing.

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44. IMPACT ON AIR POLLUTION ON HUMAN HEALTH

K. SURESH, Ph.D (FT) Research Scholar PG & Research Department of Economics Pachiayappa's College for men Kanchipuram.

Dr.N.PALANIRAJ Associate Professor & Head PG & Research Department of Economics Pachiayappa's College for men Kanchipuram.

INTRODUCTION

Among the most pressing of today's environmental issues is the pollution of air. Air is the breath of life, yet there many kinds of air pollution contributing to problems that range from human health issues to climate change. Air pollution can be defined as the presence of toxic chemicals or compounds in the air, at levels that pose a health risk. In an even broader sense, air pollution means the presence of chemicals or compounds in the air which usually not present and which lower the quality of the air or cause detrimental changes to the quality of life. Air pollution is the leading environmental cause of death worldwide according to the state of global air 2017, a new first annual report and interactive website launched today. The report also finds that 92% of the world's population lives in areas with unhealthy air. All told, long-term exposure to fine particulate matter the most significant element of air pollution contributed to 4.2 million premature deaths and to a loss of 103 million healthy years of life in 2015, making air pollution the 5th highest cause of death among all health risks, including smoking, diet, and high blood pressure.

The analysis found that China and India together were responsible for over half of the total global attributable deaths, the study also finds that increasing exposure and a growing and aging population have meant that India now rivals China for among the highest air pollution health burdens in the world, with both countries facing some 1.1 million early deaths from air pollution in 2015.

Air pollution is probably one of the most serious environmental problems confronting our civilization today. Most often, it is caused by human activities such as transportation, mining, construction, industrial work, agriculture, smelting, etc. However, natural processes such as volcanic eruptions and wildfires may also pollute the air, but their occurrence is rare and they usually have a local effect, unlike human activities that are ubiquitous causes of air pollution and contribute to the global pollution of the air every single day.

AIR POLLUTION IN WHO

Air pollution is the contamination of indoor or outdoor air by a range of gasses and solids that modify its natural characteristics. Key health harmful pollutants include particulate matter, carbon monoxide (CO), ozone (O3), blackcarbon (BC), sulfur dioxide and nitrogen oxides (NOx).

Air pollution is often not visible to the naked eye as the sizes of the pollutants are smaller than the human eye can detect. The fact that you cannot see the air pollution does not mean that it does not exist. They can become visible in some situations for example in the form of sooty smoke from the open burning of crop residues or other waste, as well as from burning wood, coal, petrol and diesel fuels for cooking and heating, transport or power production.

CAUSES OF AIR POLLUTION

Anything people do that involves burning things, using household or industrial chemicals or producing large amounts of dust the potential to cause air pollution. Step back a century or two and the cause of most air pollution was easy to identify; filthy factories, powering the Industrial Revolution. Today, tighter air pollution laws, greater environmental awareness, and determined campaigns mounted by local communities make it far harder though by no means impossible for factories to pollute in post industrial nations such as the United States and Britain. The biggest culprit today is traffic, though power plants and factories continue to make an important contribution. Before we start laying the blame for air pollutions let's remember one very important thing most of us drive cars, use electricity and buy goods made in factories. If we're pointing fingers, ultimately we're going to have to point them at ourselves. Now let's look a bit closely at the three key sources of air pollution

- Traffic
- Smog
- Power plants
- Industrial plants and factories

AIR POLLUTION IN INDIA

Many major Indian cities, including Mumbai, Pune and Kolkata, grapple with air pollution. However, India's air pollution crisis is largely due to the noxious, winter air quality in Delhi and some cities in north and central India. In 2016, the World Health Organization put 10 Indian cities on the list of the world's most polluted.

In 2016, severe air pollution has disrupted everyday life, especially during the winter. In 2015 air pollution (PM2.5) levels increased in a rapid manner overtaking even China. Even though pollution levels are increasing across the country, the emphasis so far has been on Delhi. There has been a growing realization that the majority of Delhi's pollution is coming from outside its borders and that pollution levels in other states like Karnataka, Tamil Nadu and Maharashtra are also increasing. However, the country is yet to come to the full understanding that air pollution is a national problem and to win the fight against it, we need to act as a country and across city or even regional boundaries. India's air pollution has become a public health and economic crisis.

Total Registered Motor Vehicles in India (State-Wise) As on 31st March, 2002-2012

(In thousands)

State and Union Territory	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Andhra Pradesh	5,002	5,720	6,458	7,218	6,367	7,208	8,059	8,923	10,189	12,424
Arunachal Pradesh	21 *	21*	22*	22*22*	22*	22*	22*	22*	145	151
Assam	657	727	815	914	1,021	1,116	1,235	1,384	1,582	1,807
Bihar	1,121	751	1,352	1,432	1,577	1,739	1,960	2,357	2,673	3,113
Chhatisgarh	1,076	1,216	1,375	1,541	1,734	1,935	2,115	2,436	2,766	3,104
Goa	397	436	482	529	579	624	674	727	790	866
Gujarat	6,508	7,087	7,817	8,622	9,497	10,289	10,999	11,873	12,993	14,414
Haryana	2,279	2,548	2,854	3,087	3,528	3,973	4,425	4,792	5,377	5,978
Himachal Pradesh	269	289	301	334	342	371	494	538	622	737
Jammu & Kashmir	399	439	478	524	570	620	668	739	927	917
Jharkhand	1,101	1,217	1,357	1,505	1,686	1,850	2,038	2,767	3,113	3,158
Karnataka	3,738	3,977	5,436	6,220	5,486	6,217	6,953	9,044	9,930	10,910
Kerala	2,552	2,792	3,122	3,559	3,957	4,430	4,860	5,398	6,072	6,893
Madhya Pradesh	3,459	3,804	4,188	4,609	5,047	5,523	6,011	6,591	7,356	8,144
Maharashtra	8,134	8,969	9,936	10,966	12,171	13,335	14,451	15,768	17,434	19,432
Manipur	97	106	114	124	133	147	147	194	207	125
Meghalaya	73	73	92	104	117	128	142	158	176	198
Mizoram	37	42	47	52	61	66	70	80	93	102
Nagaland	162	172	172	184	210	226	240	254	273	291
Orisea	1,359	1,525	1,715	1,932	2,148	2,370	2,607	2,932	3,338	3,759
Punjab	3,308	3,529	3,876	4,035	4,294	4,573	4,832	5,274	5,274	6,263
Rajasthan	3,487	3,834	4,261	4,754	5,336	5,902	6,490	7,166	7,986	8,985
Sikkim	15	17	20	22	25	26	29	34	39	43
Tamil Nadu	8,005	8,575	9,257	10,054	10,981	11,930	12,891	14,062	15,638	17,412
Tripura	66	76	73	106	120	131	144	160	188	204
Uttara Khand	457	516	573	643	643	731	787	831	997	1,244
Uttar Pradesh	5,928	6,460	7,344	7,989	9,086	9,826	10,779	11,988	13,287	15,445
West Bengal	2,366	2,548	2,681	2,872	3,198	2,762	3,044	2,747	3,261	3,861
A&N Islands	28 +	28+	37	41	48	53	60	62	69	77
Chandigarh	562	586	617	647	678	712	747	949	1,008	1,058
D&N Haveli	31	35	40	45	51	58	63	69	76	85
Daman&Diu	44	48	51	55	62	68	70	72	78	85
Delhi	3,971	4,237	4,187	4,487	5,492	5,899	6,302	6,747	7,228	7,350
Lakshadweep	5	5	5	6	7	7	7	8	9	10
Puducherry	293	313	347	384	432	484	538	599	673	755
Grand Total	67,007	72,718	81,502	89,618	96,707	105,353	114,951	127,746	141,866	159,491

There are increasing numbers of people who die prematurely every year with the increasing pollution levels. Deaths due to air pollution are only a fraction less than the number of deaths caused by tobacco usage. Global Burden of Disease (GBD), a comprehensive regional and global research program including 500 researchers representing over 300 institutions and 50 countries, has estimated that 3283 Indians died per day due to outdoor air pollution in India in 2015, making the potential number of deaths due to outdoor air pollution in India in 2015 to 11.98 lakh. On the economic front, loss of productivity and the forced closures of schools and industries have already started impacting our economy.

The World Bank estimates that India loses around 3% of its GDP due to air pollution. This makes air pollution one of the biggest issues to fight if we are to protect peoples' lives, public health and our economy. Air pollution is a complex issue, requiring an array of solutions. There are many sources that contribute to pollution across the country. Depending on region and climatic conditions, the contribution of particular sources will also differ. However, what is very clear is that irrespective of where you live, burning of fossil fuels (coal & oil) contributes majorly to air pollution levels across regions.

The purpose of this report is to show that air pollution is a national problem and it needs to be addressed equally across the country and not only in Delhi or the National Capital Region. The report also tries to identify major sources of pollution in parts of the country based on past research. As a way ahead for the country, our long term goals to solve the air pollution crisis can be universal, while short term solutions are to be decided based on the levels of pollution prevailing in the region.

VEHICLES POLLUTION

The major car pollutants are carbon monoxide, hydrocarbons, nitrous oxides, carbon dioxide, and particulates. Most car pollutants come from the exhaust but brake pads, tires, oil, grease, anti-freeze, hydraulic fluids, and cleaning agents also contribute pollutants to the environment.

Ozone- Produced by chemical reactions among pollutants, released mainly by motor vehicles (nitrogen oxides and volatile hydrocarbons).

Environmental impacts- A strong oxidant gas that damages animal respiratory systems, plant leaf cells, reducing photosynthesis. Human health concerns- A respiratory irritant causing damage to the lungs, reducing lung capacity and aggravation respiratory problems, especially in the elderly, the very young and the asthmatic. An average of 80 ppm (parts per million) for any 8 hour period. It is important to note that the current guidelines have been found to be inadequate in protecting human health and are in the process of being revised.

The total number of registered motor vehicles in India was 210023289 as on 31.3.2015. There were 7 states having more than 1000000 registered motor vehicles.

States	Registered Vehicles	Share
Maharashtra	25562175	12.17%
Tamil Nadu	22518669	10.72%
Uttar Pradesh	21635531	10.3%
Gujarat	18720561	8.91%
Karnataka	14784961	7.04%
Rajasthan	12378929	5.89%
Madhya Pradesh	11141127	5.3%

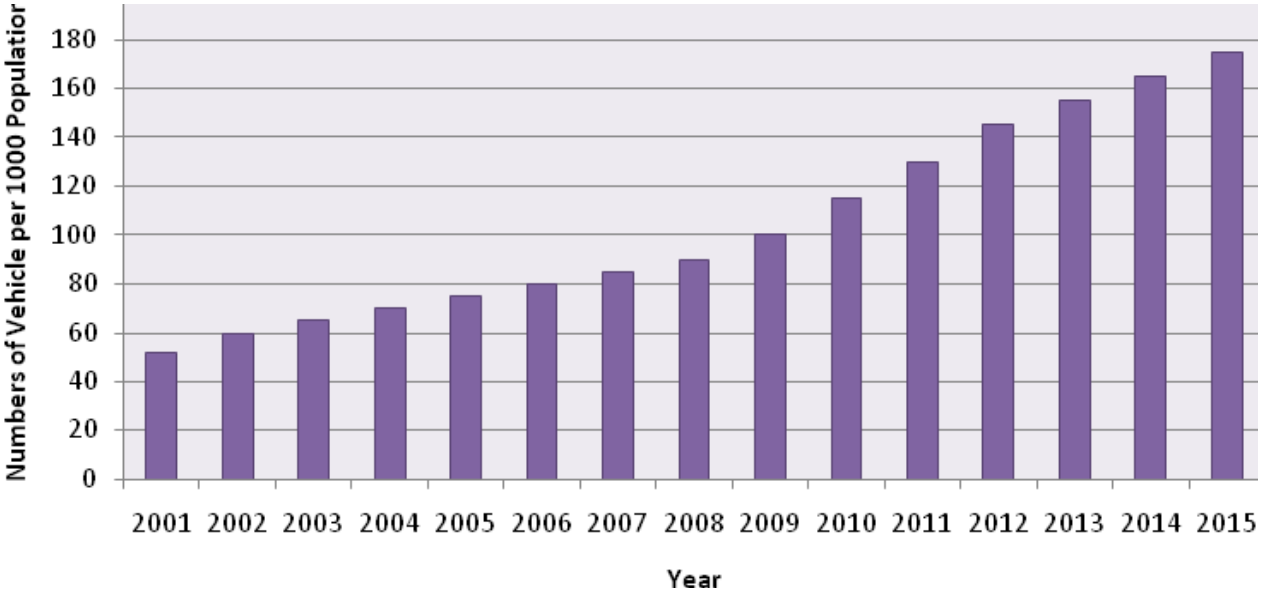
Source: road transport year book

IMPACT ON AIR POLLUTION IN HUMAN HEALTH

The Centre for Science and Environment report, "Body Burden: Lifestyle Diseases", estimated that India had 22.2 million chronic COPD patients and around 35 million chronic asthma patients in 2016. Air pollution causes 30 % premature deaths in the country, a report released on Monday by the Centre for Science and Environment (CES) has revealed.

A state level disease burden report released last week had found that household air pollution is responsible for 5% of the total disease burden and outdoor air pollution for 6%. "Lack if social support, changing diets and economic instability are the main triggers of mental disorders. Increased intake of sugar too has been linked to mental illness, making it imperative to find ways of reducing intake. An increase of PM 2.5 in the environment by 4.34 microgram/cubic metre can increase the risk of Alzheimer's", the report says.

Number of registered motor vehicles across India from 2001 to 2015 (per 1000 population)



Source: www.data.gov.in

Growth of Vehicles in Tamil Nadu

Year	Transport Vehicles	Non-Transport Vehicles	Total
2001	4,21,365	47,40,717	51,62,082
2002	4,32,106	52,25,991	56,58,097
2003	4,57448	57,51,589	62,09,037
2004	4,72,172	62,80,301	67,52,473
2005	4,93,926	74,03,744	74,03,744
2006	5,81,106	82,21,730	82,21,730
2007	6,08,325	91,03,620	91,03,620
2008	7,06,869	1,00,69,010	1,00,69,010
2009	7,84,714	1,10,40,369	1,10,40,369
2017	1234360	22610704	23845064
Source: Govt. of Tamil Nadu State Transport Authority			

Motor vehicles emit toxic and carcinogenic compounds that are known to cause cancer in humans. Hydrocarbons and nitrogen oxides contribute to smog, which damages lung tissues and aggravates respiratory disease. Smog can also inhibit plant growth and damage crops and forests. Motor vehicle pollution also contributes to the formation of acid rain and global warming.

Air pollution accounts for about 6% of deaths each year in Austria, France and Switzerland, according to a study published in the Lancet medical journal. The study found that half of the those deaths can be attributed to pollution from vehicles. The researchers also calculated that the health cost of vehicle pollution in the three countries totaled 1.7% of the gross domestic product.

The effect of air pollution on health are very complex as there are many different sources and their individual effects vary from one to the other. It is not only the ambient air quality in the cities but also the indoor air quality in the rural and the urban areas that are causing concern. In fact in the developing world the highest air pollution exposures occur in the indoor environment. Air pollutants that are inhaled have serious impact on human health affecting the lungs and the respiratory system; they are also taken up by the blood and pumped all round the body. These pollutants are also deposited on soil, plants and in the water, further contributing to human exposure. As you read on you can learn about health impacts of specific air pollutants.

Highlights

- A report by CSE stated that air pollution is responsible for 30% of premature deaths

- More than 1.73 million new cancer cases likely to be recorded each year by 2020, air pollution, tobacco, alcohol and diet change are primary triggers, said the report.
- The report established that unless environmental risk factors are acknowledged and dealt with, India will not be able to curb Non-Communicable Diseases.
- CSE in its report mentioned that 52% of them below the age of 70 and over 61% of all deaths in India attributed to lifestyle or non-communicable diseases (NCDs) instance Body Burden, as per the latest nation's health report released here by CSE.
- CSE report also mentioned that every 12th Indian is a diabetic. "India ranks second in the list of countries with highest diabetes patients," the report quoted.
- As per the findings of World Health Organization (WHO) there are four major risk factors for NCDs, instance- alcohol, tobacco, poor diet intake and lack of physical activity.
- The WHO also said that by investing just US $1-3 per person per year, countries can dramatically reduce illness and death from NCDs.
- Though the WHO has identified the major risk factors for NCDs, it is still coy in calling out the real enemy foods that are high in salt, sugar, fat and low in nutrition. It wants to play it as safe as possible so that it does not have to confront the real players and demand a restraint on their products, not through voluntary action but through government policies that restrict and restrain and put a premium on nutrition, not

CONCLUSION

Air pollution currently affects the health of millions of people. We have presented evidence on the effects of pollutants on patients with limitations in their respiratory capacities. For example, O3 and PM may trigger asthma symptoms or lead to premature death, particularly in elderly individuals with pre-existing respiratory or cardiovascular disease. In addition, pollutants enhance the release of allergenic pollen grains, which results in an increased prevalence of pollen-induced asthma.

Thus, the case for action to reduce air pollution is overwhelming and this action can take many forms. Some of these include urban planning, technological developments (e.g. the design of new vehicles that produce less pollution), and at the government level, the introduction of new laws. It has been estimated that reducing both black carbon and O3 levels would prevent over 3 million premature deaths and increase crop yields by around 50 million tones annually. Improvements to cooking stoves would also decrease demand for firewood and reduce deforestation in the developing world. Similarly, improved brick kilns that are used in parts of Latin America and Asia use 50% of the fuel used by traditional kilns.

If air pollution levels in heavy traffic areas were reduced, the incidence of asthma and other respiratory diseases would be significantly reduced. While it is generally accepted that efforts to reduce air pollution will prevent further environmental changes, they will not reverse existing warming. Interestingly, an increasing number of studies show that in individuals with low anti-oxidant levels, dietary supplements could be used as a promising approach to reducing susceptibility to air pollution, and providing an alternative strategy for neutralizing the effects of pollutants on health.

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45. EFFECT OF ALLOXAN MIXED DIET ON BLOOD PARAMETERS AND ITS MANAGEMENT BY SILKWORM PUPAE MEAL DIET IN COMMON CARP

S.RADHA, Ph.D Research Scholar, V.O.Chidambaram College, Tuticorin.

Dr.B.GEETHA, Dept of Zoology, V.O.Chidambaram College, Tuticorin.

ABSTRACT

This paper presents a brief overview on the entry of alloxan into foods and its fatal link to blood parameter in carp. The management of silkworm pupae meal diet induced Alloxan blood parameter in carp. Five series of experiments were conducted to investigate the induced alloxan on blood parameter studied In the 8th series of experiments, utilization of Silkworm pupae meal diets on the reduction of alloxan toxicity on blood parameter, were estimated. The increase in the levels of alloxan decreases the Hb and RBC level where as WBC, Esr and Ht increases during the exposure period. Then treatment with silkworm pupae meal diet there an opposite trend was obtained. The administration of silkworm pupae meal might be beneficial for the restoration of hematological parameters, in the present study have revealed that incorporate silkworm pupae meal diet reduced the blood nonfunctional plasma enzymes and liver function parameters in Alloxan induced hyperglycemia in common carp. On the other hand Alloxan-induced diabetes could increase the liver enzyme levels. The increase in these enzymes may occur due to peroxidation reactions, arising from Alloxan biotransformation during diabetes and these reactions may inflict oxidative injury to cellular components. Our data shows that the silkworm is a good edible resource of natural Silkworm pupae meal diet with hypoglycemic activity which retards the ill effect of alloxan induced hyperglycemia.

KEYWORDS: Silkworm pupae meal, Alloxan, Hb, RBC, WBC, Ht, etc.

INTRODUCTION

Maida or refine wheat flour is the “heart” of the ingredients in making of the multivarious baked goods globally. It is also used to the fish pellet feed using as binding materials.. Alloxan is an oxygenated pyrimidine derivative which is present as alloxan hydrate in aqueous solution. Alloxan was discovered by von Liebig and Wohler in 1828 and has been regarded as one of the oldest named organic compounds that exist. In diabetes, this causes the level of glucose in the blood to be too high. This causes an insulin-dependent diabetes mellitus (called “Alloxan Diabetes”) in animals, with characteristics similar to type 1 diabetes in humans. Alloxan is one of the usual substances which is a toxic glucose analogue. It is stable in dry form, but is easily oxidized and selectively destroys insulin-producing cells in the solution in the presence of air. Oxidation is accelerated by pancreas when administered to rodents and many other heat, light, alkalis and traces of copper and iron. This causes an insulin-dependent acid is a molecule composed of six carbon atoms, six diabetes mellitus (called “Alloxan Diabetes”) in these oxygen atoms and eight hydrogen atoms, all linked animals, with characteristics similar to type I diabetes in together by chemical bonds (Ankur Rohilla,shahjad ali.,2012 and Federiuk et al,2004).

India has more than 40 million diabetic individuals which represents nearly 20% of total diabetes population worldwide. DM affects approximately 4% of the population worldwide and is expected to increase by 5.4% in 2025. A number of currently existing anti-diabetic agents have number of unfavorable effects on the body. Therefore, regulation of diabetes without any side effects is still a difficult task for health care researchers. Consequently, the exploration for more successful and safer hypoglycemic agents with lesser side effects has unremitting to be a momentous area of study. Much diabetes related metabolic alterations are reported. Therefore, hematological parameters could be an important tool in the assessment of deleterious effect of drugs as well as medicinal plants Still though anti-diabetic action of crude extracts and purified bio- active components of many plants are identified, investigated related to the curative activity of medicinal plants with reference to the diabetes linked altered metabolic functions are very scanty. Diabetic models have provided considerable insight into physiological and biochemical derangement of the diabetic state (Dixit PK, Mittal S., 2013) Various hematological parameters and the immune system were also reported to be altered due to DM (Mansi k, Lahham J. 2008) Anemia is also caused in diabetic patients due to the hemolysis of red blood cells (RBCs).

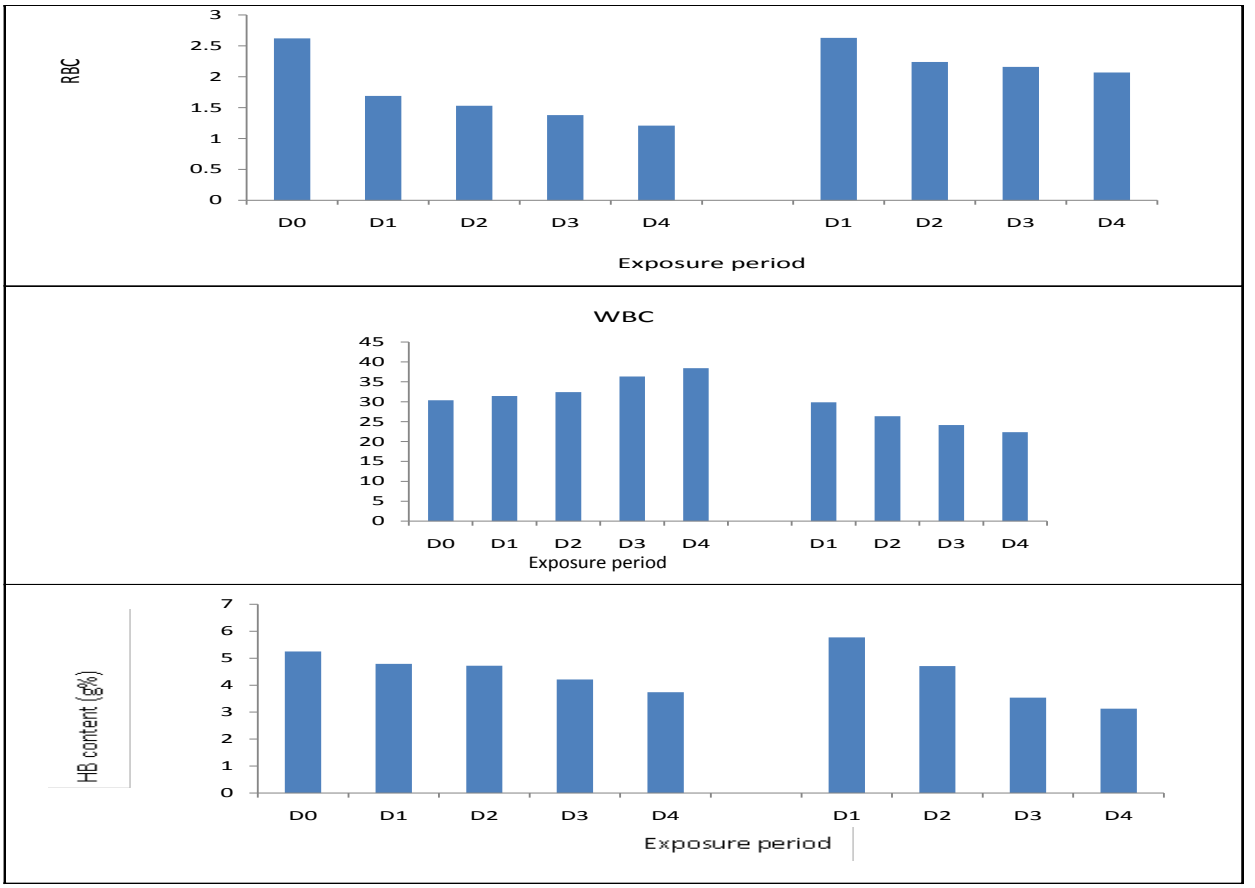
Moreover, we revealed common features between mammals and silkworm in the pharmacokinetics of antibiotics and toxic compounds (Hamamoto et al., 2009). These findings suggested us that evaluation of therapeutic activities of drugs based on pharmacokinetics using silkworms would be possible. In this paper, we introduce our recent findings on the application in the drug discovery by use of hyporglycemic silkworm In a long history of sericulture, mulberry leaves have been used for rearing silkworms. Nutrients contained in the mulberry leaves are absorbed from silkworm intestine to hemolymph and are transferred into the various organs like in mammalian animals. Silkworms have the organs such as intestine, fat body, and malpighian tubule, which function for exclusion of exogenously administrated chemicals. Moreover, silkworms can maintain glycogen as absorbed carbohydrates in the fat body and the muscle (Stake et al., 2000). Therefore, the systems for uptake of sugars and the storage mechanism show common features in silkworms and mammalian animals including humans.

MATERIALS AND METHODS

The blood parameter were studied by Routine clinical methods-Wintrobe.(1978) Five series oF experiments were conducted to investigate the induced alloxan on 0.01,0.1,1,10/1000g blood parameters in common carp. In next four series of experiments, utilization of Silkworm pupae meal diets on the reduction of alloxan toxicity on blood parameter.

RESULTS AND DISCUSSION

Fish exposed to alloxan elicited the time and concentrations dependent and significant (ANOVA : $P<0.05$) decrease in RBC count during the exposure period (Table 1). The RBC count of Common carp on days 0, 20, 40, and 60 exposed to the highest level of alloxan was 2.62, 1.69, 1.53, 1.38, and 1.18 × 106 mm-3 respectively (Table 1). The correlation coefficient was calculated for RBC count and exposure period to all the tested concentrations and it was found to be negative and significant ($P < 0.05$). However, the trend was reversed in WBC count 32.41, 34.43, 31.35, 38.43, 46.35 and ESR 3.85, 4.57, 5.27, 6.46, and 6.27 value of common carp exposed to alloxan levels (Fig. 1). Exposure of Common carp to alloxan also resulted a time and concentrations dependent ($P < 0.05$) decrease in Hb 5.25, 4.79, 4.72, 4.21, 3.74 content, calculated oxygen carrying of blood 5.57, 5.98, 5.90, 5.27, 4.68 and Ht 18.36, 15.27, 13.75, 13.24, 12.26 values. They also exerted a significant and negative between the



exposure period and concentrations of alloxan (Table 1; Fig.1). Two-way ANOVA test revealed that, alloxan levels hold significant($P < 0.05$) effect on RBC count, Hb content, ESR and Ht values while WBC count hold significant at alloxan levels and exposure period (Table1).

TABLE 1: Effects of silkworm pupae meal diets on blood parameters in alloxan exposed common carp, as a function of time. Each value is the mean ($\bar{X}$ ±SD) of three estimations.

RBC									
Rearing	Exposure Period					Treatment Period			
	D0	D1	D2	D3	D4	D1	D2	D3	D4
0	1.80 ± 0.09	1.80 ± 0.09	1.80 ± 0.09	1.80 ± 0.12	1.80 ± 0.22	1.69 ± 0.18	1.53 ± 0.34	1.38 ± 0.18	1.21 ± 0.09
20	2.15 ± 0.08	1.85 ± 0.04	1.72 ± 0.04	1.65 ± 0.16	1.58 ± 0.29	1.73 ± 0.16	1.86 ± 0.32	1.54 ± 0.17	1.35 ± 0.18
40	2.35 ± 0.14	1.76 ± 0.14	1.64 ± 0.08	1.54 ± 0.17	1.45 ± 0.14	1.95 ± 0.17	2.11 ± 0.18	1.77 ± 0.14	1.56 ± 0.16
60	2.62 ± 0.24	1.69 ± 0.18	1.53 ± 0.24	1.38 ± 0.18	1.18 ± 0.19	2.07 ± 0.14	2.16 ± 0.21	2.24 ± 0.12	2.63 ± 0.17
WBC									
0	23.01 ± 0.53	23.01 ± 0.53	23.01 ± 0.53	23.01 ± 0.53	23.01 ± 0.53	32.43 ± 0.32	31.35 ± 0.28	38.43 ± 0.19	36.35 ± 0.65
20	25.48 ± 0.23	24.46 ±0.29	26.38 ± 0.17	28.32 ± 0.27	29.33 ± 0.65	31.54 ± 0.41	28.84 ± 0.24	27.56 ± 0.21	32.69 ± 0.36
40	28.51 ± 0.81	29.27 ± 0.52	31.43 ± 0.20	29.56 ± 0.72	37.65 ± 0.50	29.16 ± 0.31	27.93 ± 0.31	26.85 ± 0.42	28.92 ± 0.51
60	32.41 ± 0.29	32.43 ± 0.32	31.35 ± 0.78	38.43 ± 0.39	36.35 ± 0.85	29.85 ± 0.21	25.07 ± 0.34	24.14 ± 0.31	22.35 ± 0.75
HB									
0	4.67 ± 0.15	4.67 ± 0.15	4.67 ± 0.15	4.67 ± 0.15	4.67 ± 0.15	4.79 ± 0.27	4.72 ± 0.22	4.21 ± 0.25	3.74 ± 0.13
20	4.77 ± 0.25	4.36 ± 0.21	4.59 ± 0.22	3.69 ± 0.64	3.78 ± 0.26	4.92 ± 0.24	4.87 ± 0.31	3.45 ± 0.15	3.95 ± 0.32
40	4.91 ± 0.23	4.58 ± 0.24	4.84 ± 0.19	4.34 ± 0.15	4.36 ± 0.15	4.51 ± 0.15	4.64 ± 0.19	3.50 ± 0.32	3.04 ± 0.13
60	5.25 ± 0.22	4.79 ± 0.17	4.72 ± 0.12	4.21 ± 0.05	3.74 ± 0.13	5.77 ± 0.03	4.71 ± 0.32	3.54 ± 0.18	3.13 ± 0.29
O2									
0	5.83 ± 0.21	5.83 ± 0.21	5.83 ± 0.21	5.83 ± 0.21	5.83 ± 0.21	7.31 ± 0.16	6.68 ± 0.29	5.51 ± 0.46	4.21 ± 0.52
20	5.95 ± 0.11	5.45 ± 0.13	5.73 ± 0.04	4.61 ± 0.12	4.73 ± 0.16	6.54 ± 0.31	6.94 ± 0.02	6.81 ± 0.74	6.27 ± 0.71
40	5.13 ± 0.13	5.73 ± 0.26	5.05 ± 0.11	5.43 ± 0.25	5.45 ± 0.24	7.72 ± 0.42	7.14 ± 0.11	7.54 ± 0.41	7.14 ± 0.68
60	5.57 ± 0.49	5.98 ± 0.18	5.90 ± 0.29	5.27 ± 0.46	4.68 ± 0.22	7.97 ± 0.88	7.14 ± 0.59	7.52 ± 0.81	7.26 ± 0.61
ESR									
0	2.53 ± 0.21	2.53 ± 0.21	2.53 ± 0.21	2.53 ± 0.21	2.53 ± 0.21	4.57 ± 0.12	5.27 ± 0.21	6.46 ± 0.24	6.27 ± 0.52
20	2.77 ± 0.39	2.97 ± 0.18	3.83 ± 0.33	3.96 ± 0.16	3.76 ± 0.16	3.65 ± 0.21	4.45 ± 0.32	5.58 ± 0.29	4.95 ± 0.41
40	3.29 ± 0.25	3.88 ± 0.24	4.56 ± 0.54	4.55 ± 0.54	4.36 ± 0.24	3.93 ± 0.25	3.68 ± 0.18	3.85 ± 0.38	5.95 ± 0.34
60	3.85 ± 0.54	4.57 ± 1.22	5.27 ± 1.25	6.46 ± 1.24	6.27 ± 1.32	2.15 ± 0.34	2.86 ± 0.31	3.36 ± 0.41	4.46 ± 0.52
HT									
0	15.80 ± 1.53	15.80 ± 1.53	15.80 ± 1.53	15.80 ± 1.53	15.80 ± 1.53	15.27 ± 0.11	13.75 ± 0.16	13.24 ± 0.29	12.26 ± 0.51
20	16.22 ± 0.25	15.82 ± 0.56	15.45 ± 0.17	14.83 ± 0.27	14.33 ± 0.32	16.27 ± 0.22	14.26 ± 0.31	13.26 ± 0.31	13.15 ± 0.39
40	17.24 ± 0.36	15.77 ± 0.52	14.27 ± 1.22	14.19 ± 0.82	14.08 ± 0.34	16.44 ± 0.52	14.73 ± 0.22	14.66 ± 0.41	14.24 ± 0.24
60	18.36 ± 0.14	15.27 ± 0.11	13.75 ± 2.16	13.24 ± 0.39	12.26 ± 0.51	16.83 ± 0.28	15.26 ± 0.27	14.73 ± 0.52	13.85 ± 0.54

Results of present study shows the levels of the heamatological changes in Common carp fed with different levels of alloxan incorporated diet. The results are as presented in Table1. The primary reasons for assessing the RBC is to check anemia and to evaluate normal erythropoiesis. Hemoglobin level indicates the amount of intracellular iron, while hematocrit, representing the volume of RBC in blood helps to determine the degree of anemia or polycythaemia. WBC was found to be increased in diabetic subject due to pathophysiological conditions including autolysis caused by some hydrolytic enzymes released by plasma under stress. SP strengthened hemopoetic system by supplying various constituent thus helps to control MCH, MCHC which was found to be decreased in diabetic subject.

The mean cell hemoglobin level is a significant index for folic acid and or Vit B12 need (Ganong.,1999) The resulting significant reduction in RBC levels and HCT levels in the treatment groups of ethyl acetate fraction and ethanol extract with significant increases in their MCV and MCH levels when compared with the diabetic control group may be due to hematotoxic effects associated with toxic substances on bone marrow depression caused by damage to multiple classes of hematopoietic cells and a variety of hematopoietic functions (Synder and Hadli, 1996). Reactive O2 species generated during alloxan metabolism is

implicated in red cell damage (Rao et al.,2003), diabetic rats forms glycosylated hemoglobin hence, decreased total hemoglobin (Sheela and Augusti, 1992). There was no change in the red cell indices of the diabetic rats treated with butanol, methanol, glibenclamide, n-hexane. This result was similar to that reported by some researchers (Mohammed et al., 2009; Edet et al., 2011). This was consistent with the report (Ajagbonna et al., 1999) on the ability of medicinal compounds or drugs in altering the normal range of hematological parameters. Alloxan monohydrate is known to induce diabetes by partial destruction of pancreatic beta cells of islet of langerhan.

This results in depletion of insulin levels and hyperglycemia leading to DM. The alloxan-treated mice, therefore, appear to represent a good laboratory model for DM. There is possibility for the survival of a few beta-cells and this has been proved by several workers who observed antihyperglycemic activity with oral hypoglycemic agents like glibenclamide, tolbutamide etc. in alloxan-induced diabetic mice (Sheeja et al,1993,Subramanian et al, 1996.) Similarly, significant decrease in the haemoglobin content and packed cell volume were also observed in mice due to pathophysiological condition when treated with heavy metals tartrazine, food colours chemical dye, sodium benzoateand fluorid]. These chemicals also caused elevation in blood glucose levels. (Chouhan S. Flora .,2008) investigation was to evaluate the efficiency of the aqueous leaves extract of S. cumini on alloxan-induced metabolic changes diabetic rats. Decreased Hb content was observed in diabetic rates might be due to increased formation of glycosylated Hb. Generally total hemoglobin levels is much below the normal levels in diabetic subject by (Chandaliam.,2002) and HbA1c levels has been reported to be increased in patients with diabetes mellitus. Alloxan-induced diabetic mice showed significantly reduced blood levels when compared to the normal control group. Alloxan is a well known chemical has been reported to suppress the immune system by destroying certain cells and organs in the body as was observed in this present study. The alteration of these parameters could be attributed to change in the number of leucocytes which may account for poor defensive mechanisms against infection, thus may have consequential effects on the immune system and phagocytic activity of the animals.

CONCLUSION

The administration of silkworm pupae meal might be beneficial for the restoration of biochemical and hematological parameters, in the present study have revealed that incorporate silkworm pupae meal diet reduced blood nonfunctional plasma enzymes and liver function parameters in Alloxan induced hyperglycemia in Common carp. On the other hand Alloxan-induced diabetes could increase the liver enzyme levels. The increase in these enzymes may occur due to peroxidation reactions, arising from Alloxan biotransformation during diabetes and these reactions may inflict oxidative injury to cellular components. Our data shows that the silkworm is a good edible resource of natural Silkworm pupae meal diet with hypoglycemic activity.

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46. A STUDY OF MUNICIPAL SOLID WASTE GENERATION ON URBAN ENVIRONMENTAL CHALLENGES

K.HEMANATH,Ph.D,Research Scholar(Full- Time) in Economics, Pachaiyappa's College, Chennai 600 030.E-Mail: hemanth_mail25@yahoo.co.in; Mob- 09884532929

Dr. M.SIVARAJAN, Associate Professor of Economics, Pachaiyappa's College, Chennai 600 030.E- mail: rajan.msiva@gmail.com ; Mobile : 094447 65373.

ABSTRACT

India is growing and so are the mountains of waste its cities and villages are producing. The composition of waste is also witnessing a major shift as the use of plastics and paper grow with the rise of the middle class and a consumerist culture. Urbanization and population growth are solely responsible for high increasing rate of solid waste. With the increase of urban population and the rising needs of various goods and services as a result of higher level of consumption pattern, there has been a rapid increase in the generation of municipal solid waste by households, industries, institutions and commercial establishments. The decomposition of waste into constituent chemicals is a common source of local environmental pollution. This problem is especially acute in developing nations. Very few existing landfills in the world's poorest countries would meet environmental standards accepted in industrialized nations, and with limited budgets there are likely to be few sites rigorously evaluated prior to use in the future. The problem is again compounded by the issues associated with rapid urbanization. A major environmental concern is gas release by decomposing garbage. Methane is a by-product of the anaerobic respiration of bacteria, and these bacteria thrive in landfills with high amounts of moisture. Methane concentrations can reach up to 50% of the composition of landfill gas at maximum anaerobic decomposition. A second problem with these gasses is their contribution to the enhanced greenhouse gas effect and climate change. In this paper, an attempt analyze the urban growth, generation of municipal solid waste and its impact on environmental challenges.

INTRODUCTION

Population growth and rapid urbanization means bigger and denser cities and increased MSW generation in each city. Increase in MSW will have significant impacts in terms of land required for disposing the waste as it gets more difficult to site landfills. Farther the landfill gets from the point of waste generation (city), greater will be the waste transportation cost. Based on a business as usual (BAU) scenario of 91% land filling, the study estimates that the waste generated by 2001 would have occupied 240 sq.km or an area half the size of Mumbai; waste generated by 2011 would have occupied 380 sq.km or about 220,000 football fields or 90% of Chennai, the fourth biggest Indian city area-wise; waste generated by 2021 would need 590 sq.km which is greater than the area of Hyderabad (583 sq.km), the largest Indian city, area-wise. 2014 report of the Planning Commission Committee chaired by K Kasturirangan found that 62 million tonnes of MSW was produced per year, which is based on an average of 0.45 kg per capita per day for India's urban population. According to a latest CPCB report, in 2016, India produced some 52 million tonnes of waste each year, or roughly 0.144 million tonnes per day, of which roughly 23 per cent is processed taken to landfills or disposed of using other technologies. Since then, data on generation of solid waste is calculated by multiplying the urban population by the amount of waste generated per capita per day. This makes estimates of solid waste generated in the country pretty much a guesstimate which, in turn, confounds management. However, what the estimates do demonstrate is the fact that bigger and richer cities produce more waste than poorer cities. This is not only due to their larger population, but also because their residents are more affluent and bigger generators of waste. Waste-to-Energy Research and Technology Council (WTERT) the Chennai city generates about 0.71kg of garbage per capita everyday - the highest in the country. Kolkata is second with 0.66kg per day followed by Delhi and Hyderabad with 0.65kg.

URBANIZATION AND SOLID WASTE GENERATION IN INDIA

About 31.2% population is now living in urban areas. Over 377 million urban people are living in 7,935 towns/cities. India is a vast country divided into 29 States and 7 Union Territories (UTs). There are three mega cities—Greater Mumbai, Delhi, and Kolkata—having population of more than 10 million, 53 cities have more than 1 million population, and 415 cities having

population 100,000 or more. The consequences of burgeoning population in urban centers are more noticeable in developing countries as compared to the developed countries. The population of urban India was 377 million (Census of India, 2011a)1, which accounts for 31% of the total population. Global case histories reveal that when a country's urban population extends beyond 25% of the overall population (as in the present case), the pace of urbanization accelerates (Kumar & Gaikwad, 2004)2. The population residing in urban regions increased from 18 to 31.2% from 1961 to 2011 respectively (Census of India, 2011b)3. Planning Commission Report (2014)4 reveals that 377 million people residing in urban area generate 62 million tons of MSW per annum currently and it is projected that by 2031 these urban centers will generate 165 million tons of waste annually and by 2050 it could reach 436 million tons. About 23.5 × 107 cubic meter of landfill space is required and in terms of area it would be 1,175 hectare of land per year. The area required from 2031 to 2050 would be 43,000 hectares for landfills piled in 20 meter height. These projections are based on 0.45 kg/capita/day waste generation.

SOURCES OF MUNICIPAL SOLID WASTE GENERATION

Municipal waste is generally defined as waste collected by municipalities and other local authorities. However, this definition varies from country to country. There are primarily two types of solid waste – (i) Municipal Solid Waste (MSW) and (ii) Industrial waste. Municipal solid waste is commonly known as trash or garbage, it consists of : Food Waste ; Garden (Yard) and Park Waste; Paper and Cardboard; Wood; Textiles; Nappies (Disposable diapers); Rubber and Leather; Plastics; Metal ; Glass (and Pottery); Other (e.g., Ash, Dirt, Dust, Soil, Electronic waste). Industrial waste is mainly found in the same waste types as in MSW. Most of the MSWs are hazardous in nature. Hazardous waste is a waste that is dangerous or potentially harmful to both health and the environment. Hazardous wastes can be liquids, solids, gases, sludges, discarded commercial products (e.g., cleaning fluids or pesticides), or the by-products of manufacturing processes.

REVIEW OF LITERATURE

One notable environmental problem that has bedeviled the nation since the 1970s is municipal solid waste. MSW affects the environment in different parts of the globe. In Nigeria the oil boom of the 1970s had resulted into increase in the volume of individual, commercial and industrial activities in towns and cities of the country. These gave birth to many environmental problems such as flood, erosion, solid waste materials, global warming, desertification/drought and pollutions. It is observed that municipal solid waste in Kano that are put into enormous piles often decompose to emit methane a "greenhouse gas" that is more potent than carbon dioxide. This methane contributes to global warming which could result into climate change as a result of destruction of ozone layer (Sharma, 2010)5. Direct exposure can lead to diseases through chemical exposure as the release of chemical waste into the environment leads to chemical poisoning. Co-disposal of industrial waste with municipal waste can expose people to chemical and radioactive hazards. Open dumpsites are a major problem to the environment especially to the air that we inhale.

Solid waste pollutants serve as an external force affecting the physico-chemical characteristics of soil ultimately contributing towards the poor production of vegetation (Papageorgiou, 2006)7. The pollutants, in the first place, hinder the normal metabolism of plants which is an invisible injury and owing to which the visible injury appears in the aftermath. It is depriving our ecosystem of the natural balance and bear result beyond any repair. Assessment of soil pollution becomes difficult when contaminants belong to different sources and their products are variably distributed (Partha et al., 2011)8. Chemical properties of soil serve as main reason of vegetation changes (Neave et al., 1994)9. In plants accumulation of chemical elements depends not only on their absolute content in a soil but also on the level of fertility, acidic–alkaline and oxidative-reductive conditions and on the presence of organic matter (Subbiah and Asija, 1976)10. The disturbances of higher intensity sometimes endanger the survival of some species and yield to low richness. In this regard, developing countries are even deeper into the chaos as having poor financial resources to upgrade their disposal facilities and turned out to be more vulnerable to the hazards of dumping for their environment (Hazra and Goel, 2009)

Over the last many years, heavy metals have considerably damaged the soil quality and fertility in consequence of increased environmental pollution from industrial, agricultural and municipal sources. Metals cause physiological disorders in soils as absorption through root system consequently retards plant growth and deprives it of vigour. Waste carries different metals which are then transferred to plants by different ways. Depending on the tendency of the

contaminants they end up either in water held in the soil or leached to the underground water. Contaminants like Cd, Cu, Ni, Pb and Zn can alter the soil chemistry and have an impact on the organisms and plants depending on the soil for nutrition .Diversity of vegetation is directly influenced by soil characteristics. Many studies show evidence of seriousness of hazards caused by open waste dumping ultimately affecting the plant life on the planet leading towards an irreversible erosion trend unless the present land use pattern is checked (Phil-Eze, 2010)12.

A study examined the environmental and health impacts of households living around and away (far away) from the Granville Brook dumpsite in Freetown, Sierra Leone, revealed that both nearby residents and far away residents suffered from related diseases due to the location of the dumpsite closer to their settlements. It was discovered that residents less than fifty meters from the dumpsite are most affected by the dumpsite. Hence, they were victims of malaria, chest pains, diarrhea, cholera, irritation of the skin, nose and eyes. This state of health of respondents in this study can be linked to pollution from the dumpsite. It was also noted that the extent of air and water pollution is worse in the raining season as a result of offensive and disease carrying odor, as well as ground water pollution. In the dry season, the smoke from the incineration of the dumpsite is an important source of air pollution for people living far away from the dumpsite. They therefore complained about chest pains (Foday Pinka Sankoh, Xiangbin Yan, Quangyen Tran: 2013).

QUANTITY OF MUNICIPAL SOLID WASTE GENERATED IN INDIA

Generation of MSW has an obvious relation to the population of the area or city, due to which bigger cities generate more waste. The metropolitan area of Kolkata generates the largest amount of MSW (11,520 TPD or 4.2 million TPY) among Indian cities. Among the four geographical regions in India, Northern India generates the highest amount of MSW (40,500 TPD or 14.8 million TPY), 30% of all MSW generated in India; and Eastern India (23,500 TPD or 8.6 million TPY) generates the least, only 17% of MSW generated in India. Among states, Maharashtra (22,200 TPD or 8.1 million TPY), West Bengal (15,500 TPD or 5.7 million TPY), Uttar Pradesh (13,000 TPD or 4.75 million TPY), Tamil Nadu (12,000 TPD or 4.3 million TPY) Andhra Pradesh (11,500 TPD or 4.15 million TPY) generate the highest amount of MSW. Among Union Territories, Delhi (11,500 TPD or 4.2 million TPY) generates the highest and Chandigarh (486 TPD or 177,400 TPY) generates the second highest amount of waste.

MUNICIPAL SOLID WASTE IN TAMILNADU

In Tamilnadu there are 14 Municipal Corporations -Chennai, Coimbatore ,Madurai, Tiruchirappalli, Salem, Tirunelveli, Thoothukudi, Tiruppur, Erode ,Vellore, Thanjavur , Dindigul and 152- Municipalities. Waste-to-Energy Research and Technology Council (WTERT) the city generates about 0.71kg of garbage per capita everyday — the highest in the country. Kolkata is second with 0.66kg per day followed by Delhi and Hyderabad with 0.65kg. About 500g of waste per capita is generated by 70% of the country's urban population. Kolkata generates 12,060 tonnes of waste daily, followed by Mumbai (11,645 tonnes) and Delhi (11,558 tonnes). In Chennai, which generates 6,404 tonnes of waste daily, the garbage generated by an average household includes 25% recyclable waste, 60% organic waste and 10% hazardous waste. At least 30% of garbage goes into drains, while many vacant plots and pavements have become unofficial dump yards. The city, with about 730 hospitals, also generates an average of 9,898kg of biomedical waste a day (Time of India:2014).

PER CAPITA MUNICIPAL SOLID WASTE GENERATED IN INDIA

Cities in Western India were found to be generating the least amount of waste per person, only 440 grams/day, followed by East India (500 g/day), North India (520 g/day), and South India. Southern Indian cities generate 560 grams/day, the maximum waste generation per person. States with minimum and maximum per capita waste generation rates among bigger states, each person in Gujarat generates 395 g/day; followed by Orissa (400 g/day) and Madhya Pradesh (400 grams/day). Among states generating large amounts of MSW per person are Tamil Nadu (630 g/day), Jammu & Kashmir (600 g/day) and Andhra Pradesh (570 g/day). Among Union Territories, Andaman and Nicobar Islands generate the highest (870 grams/day) per capita, while Lakshadweep Islands (340 grams/day) generates the least per capita. Per capita waste generation in Delhi, the biggest Union Territory is 650 g/day. A total of 366 cities and towns represent 70% of India's urban population and provide a fair estimation of the average per capita waste generation in Urban India (0.5 kg/day). The average per capita waste generation in India is 370 grams/day as compared to 2,200 grams in Denmark, 2,000 grams in US and 700 grams in China.

A 2012 study by Columbia University on solid waste management in India analysed the per capita waste generation in the context

of the growth in the population of India. The study also did per capita MSW estimations, extrapolated till 2041 when it would be around 0.74 kg per person per day. As per a 2015 paper in International Journal for Research in Applied Science and Engineering Technology (IJRASET) on quantification of solid waste,5 per capita waste generation is approximately 500 g per person per day. CSE surveyed different kinds of cities in the year 2014–15 across the country to understand the status of waste generation in the country. It found that on an average, the generation of waste is 350–600 g per capita per day.

CONCLUSION

With increase in the urban population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by each household, industries, construction and other sources. Waste that is not properly managed, especially excreta and other liquid and solid waste from households and the community, are a serious health hazard and environmental damages. Waste dump yards also cause to serious consequences on water pollution pose to environmental treats. To avoid, the government takes serious measures in terms of proper collection and disposal of waste and adopt waste management techniques to save the earth.

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47. ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPLICATIONS OF URBAN SOLID WASTE AND NEED FOR VALORIZATION OF WASTE

Dr.S JAMEELA, Associate Professor, Department of Political Science and Director, Centre for Women's Studies, JBAS, Chennai.

ABSTRACT

"Source reduction is, on the face of it, perhaps the most appealing
of all the possible approaches to solid-waste management"
- William Rathje and Cullen Murphy

Waste poses a threat to public health and environment and hence it should be properly collected and disposed. Managing municipal solid waste is a pervasive problem for any urban area and the Singara Chennai is no exception to it. Admitting that it is one of the best managed city, but still problem of dealing with solid waste generated in the ever expanding Chennai city is an uphill task. The materialistic world has been sustaining, so to say, by transforming natural resources into garbage. This is an unnatural behavior because mother nature does not throw stuff away – dead trees, birds, beetles and for that any natural material including human being are pretty quickly recycled by the earth system. Our perception of waste as an unwanted material with no intrinsic value has to change because of the fact that the waste generated is a resource with transformed material. Hence, to extract value from this science, technology and attitudinal changes are the need of the hour for converting the ever increasing waste into wealth.

For a long time our economy has been linear but there is a positive shift to the circular economy which has changed the way we look at the urban solid waste which no longer remains a waste but is a resource now. The paper deals with the environmental and health implications of the urban solid waste and its impact on society if a timely intervention to make it a part of circular economy is not attempted seriously. The paper brings out the economic, social and environmental benefits of treating solid waste as a resource.

INTRODUCTION

Every Indian is proud that the country is on the path of rapid progress. The rapid development and industrialization is forcing an unprecedented change in the social and economic fabric of the country and has its own impact on the environment in which we live. With a population of about 1.3 billion (almost 18% of world population) and with a share of only 5% of the world's area the task of managing resources, including human resources, is uphill because a delicate balance is to always to be maintained. India is one of the fastest growing economy and is moving steadily to achieve a GDP of 10% in a decade or so. The growth of the country and its emergence as a world power has also resulted in high expectations of the people in terms of quality of life. However, the fact remains that this change has forced migration of rural people to urban areas in search of better livelihood and hence life. The negative side of this migration, from rural to urban areas, is the stress on urban infrastructure (like water, electricity, roads etc.) on one hand and adverse impact on environment on the other. One of the recent estimates puts that only 70% of the solid waste generated by urban population is collected and that in terms of quantum works out to a whopping 62 million tonnes per year with about 10% of this being plastic waste and another 12% other hazardous waste.

Our resources which include water, energetic resources, agricultural land, fish stock, minerals and forest to name some, are limited. Also inefficient use of these resources will in the longer run have impacts like deforestation, desertification (soil erosion), pollution of water soil and air, loss of biodiversity, reduction of natural capital which will lead to conflicts in the society on one hand and migration of people on the other. Hence, all the discussions in this paper is on the premise, which is the well known and accepted reality of life, that the natural resources are limited and some of them are close to finish. Also that we are consuming these natural resources fast and that the time has come to use them efficiently because so far we are using them inefficiently. Another dark reality is that we are producing too much waste and only a very small portion of waste produced go back to the economic cycle. It is the last part, that recycling is very meagre, which is to change and that change has to come fast. Valorization of the waste is the way forward and we all must try our best for the social and economic benefit of the society on one hand and protection of the environment on the other.

Swatchh Bharath (Clean India) is a recent initiative of Government of India, where in

the awareness and corrective measures are being encouraged and in some cases made mandatory. Tamilnadu, as expected performs better in comparison to other parts of the country. When we analyse the scenario for metro cities, Chennai stands out in managing solid waste. It is heartening to note that Chennai has approximately 465 Hectare of landfill area, which is almost double of the other three metros viz Delhi, Mumbai and Kolkata put together. The difficulty with the landfill is that these are to be located outside the city which increases the cost of transportation as the cities expand. Rapid growth of city means frequent relocation of landfill areas and that will mean more cost towards the transportation. This economic burden is what makes the work of corporation unenviable.

Different times and different urban areas have tried out various techniques and so far it is believed that source segregation is the best way to deal with it. Releasing this, solid waste management rules 2016 have made segregation mandatory for every waste generator but unfortunately, its implementation is very poor. As of now most of the garbage of urban India remains untreated. One research group predicts that if India continues to dump untreated garbage at its current rate, then it will need a landfill of size 66,000 hectares which is 10 metres high and can hold 20 yrs worth of waste. Municipal solid waste management (MSWM), a critical element towards sustainable metropolitan development, comprises segregation, storage, collection, relocation, carry-age, processing, and disposal of solid waste to minimize its adverse impact on environment. Unmanaged MSW becomes a factor for propagation of innumerable ailments (Kumar et al., 2009). High population growth rates, rapidly varying waste characterization and generation patterns, growing urbanization and industrialization in developing countries (Troschinetz & Mihelcic, 2009) are the important reasons for paying attention towards MSWM as more area is required to accommodate waste (Idris, Inane, & Hassan, 2004).

This paper deals with analyzing the present scenario and suggesting ways to deal with the solid waste generated in the country. The paper makes a case of implementing valorization of solid waste as a management strategy for better social, economic and environment impact.

Municipal solid waste is one form of the manifestation of unsustainable consumption of natural resources by humankind which has led to, and continues to lead to, the depletion of natural capital and environmental degradation (Berg, et al., 2013; Taylor, 2000; Zaman & Lehmann, 2013). Cities have for a long time been 'swallowed' in garbage as dump sites mushroom in all corners, blocking drainages, contaminating water sources, causing disease among the population and impairing the aesthetic value of the landscape (Wright & Boorse, 2011).

URBAN SOLID WASTE COMPOSITION

India has different geographic and climatic regions (tropical wet, tropical dry, subtropical humid climate, and mountain climate) and four seasons (winter, summer, rainy, and autumn) and accordingly residents living in these zones have different consumption and waste generation pattern. However, till date, no concrete steps had been taken to analyze regional and geographical-specific waste generation patterns for these urban towns and researchers have to rely on the limited data available based on the study conducted by various agencies (central, state, NGO etc.) (Rajkumar Joshi and Sirajuddin Ahmed, 2016) Solid waste is anything that is not a liquid and which is thrown away because it is not wanted. Urban solid waste is Municipal Solid Waste (MSW), commonly known as garbage is a waste type consisting of everyday items that are discarded by the public after their use. Major sources of solid wastes in urban areas include residential sources, commercial sources, institutional sources, open area, industrial sources, health facilities (hospital etc), construction and demolition, agriculture sources, electronic and electrical waste (e- wastes).Among these residential wastes contributes little over 50% and commercial waste another 25 %. Another way of looking at the urban solid waste can be by classifying it as biodegradable solid waste, i.e. the waste which can be broken down into their constituent elements by bacteria and other micro organisms and non biodegradable solid waste where in bacteria cannot decompose this waste. Yet another way of classifying them may be hazardous and non hazardous wastes.

LINEAR AND CIRCULAR ECONOMY

There could be three ways economy can work. First, the linear economy in which raw materials are used to make a product and after its use any waste is thrown away. Second, reuse economy, in which the material is recycled and reused. Third, in which a new raw material needed is obtained sustainably so that natural and human environment is not damaged. Hence, a circular economy is an alternative to a traditional linear economy in which we keep resources in use for as long as possible, extract the maximum value from them while in use. Hence, a circular economy is an economic system where products and services are traded in closed loops or cycles. This ensures long life, optimal reuse,

refurbishment, remanufacturing and recycling of products and materials. According to Winkler (2011, p. 244) "studies show that the share of reused or recycled materials can be increased up to 80% by closing process chains (instead of 1% with unclosed process chains)."

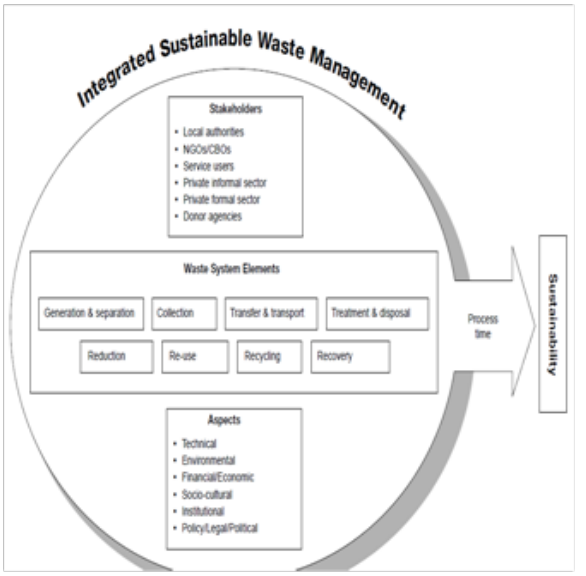
A circular economy preserves the value added in products for as long as possible and virtually eliminates waste. It retains the resources within the economy when a product has reached the end of its life, so that they remain in productive use and create further value. It may involve (http://ec.europa.eu/environment/circular-economy/index_en.htm) :

- Increasing the time of products to deliver their service before coming to the end of their useful life (durability);
- Reducing the use of materials that are hazardous or difficult to recycle (substitution);
- Creating markets for recycled materials (standards, public procurement);
- Designing products that are easier to repair, upgrade, remanufacture of recycle (eco-design);
- Incentivising waste reduction and high-quality separation by consumers;
- Incentivising separation and collection systems that minimise the costs of recycling and reuse;
- Facilitating industrial clusters that exchange by-products to prevent them from becoming wastes (industrial symbiosis);
- Encouraging wider consumer choice through renting or leasing instead of owning products (new business models)"

Burnley, et al. (2015) and Cucchiella, et al. (2014) argue that using waste to generate energy in waste to energy plants, where systems to sort or reclaim materials from waste do not exist, was environmentally and economically sustainable than sending the waste to a landfill. Circular economy will also ensure that there is no burning of waste at landfill area which often leads to environmental and pollution related problems in the nearby urban settlements. Every metro city faces these problems at regular interval of time and with circular economy as a solution the practice of burning of landfill waste will become a thing of past as there will be value to the waste.

Waste management hierarchy arranges Reduce- lowering the amount of waste produced, Reuse- using material repeatedly, Recycle- using materials to make new products, Recovery- recovering energy from waste and lastly landfill- safe disposal of waste to landfill in order of decreasing priority. This means that landfill to be the last alternative however, in India this is most of often than not taken as the only option to treat the waste. This has to be changed and that can happen more suitably by adopting the model of circular economy. We should work on integrated sustainable waste management which could be a physical system and its technological components, sustainability aspects (social, institutional, political, financial, economic, environmental and technical) and various groups of stake holders involved Wilson, et al., 2012.

A schematic presentation of this model is presented in the figure below



Integrated Sustainable Waste Management Model (after Anschutz et al.,2001)

This system once adopted will ensure waste value chain based circular economy approach, which is expected to be sustainable while fulfilling aspirations of the society in terms of economic and environmental outcomes. A resource value chain may include should be redesigned from present

Producer- Wholesaler- Retailer- consumer/ waste generator- waste disposer (generally the municipal corporations

to

Producer- Wholesaler- Retailer- consumer/ waste generator- Collector- aggregator- processor – Producer

In this manner the cycle will start from Producer and end with Producer making it a Circular Process/ System.

VALORIZATION OF URBAN SOLID WASTE

World population is growing and to ensure there is enough food, water and prosperity for everyone, there is a need to switch from linear

to circular economy. One of the examples of circular economy and valorisation of waste is from food waste. Reducing food waste has enormous potential for reducing the resources we use to produce, manage, transform, distribute, store and cook the food we eat. World over food has been identified as a key sector where resource efficiency should be improved and called for ambitious action to tackle food waste. Circular economy plays a vital role in managing food waste and is the best example of it.

VALORIZATION OF FOOD WASTE

Ever increasing world population means increasing demand for food production and processing industry associated with it and consequently the generation of a large amount of food waste. This fact opens a plethora of opportunities for effective waste management and measure for proper treatment, reuse or disposal of waste. Food is store house of complex carbohydrates, proteins, lipids and lipids and so is the food waste. These could be raw material for various processes and which can be used for valorization of food. Food supply food chain can be analyzed and the waste generated could be used for production of biofuels, enzymes, bioactive compounds, biodegradable plastics and nano particles to name a few.

Let us consider the valorization of food waste by analyzing the food supply chain of the food waste. This supply chain can be divided into two major groups (i) Plant derived food waste and (ii) animal derived food waste.

1. PLANT DERIVED FOOD WASTE:

a. Extraction / Processing: we can use the technology for extraction of Lipids, Hemicellulose, Bioactive compounds/ nutraceuticals, Pectin, Starch, Phytochemicals, Phenols, Biodiesel, Activated carbon. All these can then be used as raw materials for various applications.

b. Incineration: converting the food waste in to Fly Ash and then to Hydrogels for various applications.

c. Pretreatment and Hydrolysis: under this, the od waste is converted to sugars which is then fermented and finally used as raw material for conversion to Bioethonol, Butanol, Enzymes, Bioydrogen, Bioplastics etc.

d. ***Anerobic Digestion:*** this is a process in which using bacteria the food waste is converted in to heat, power and finally bio fertilizer.

2. ANIMAL DERIVED FOOD WASTE:

a. Anerobic Digestion: this is a process in which using bacteria the food waste is converted in to heat, power and finally bio fertilizer.

b.Extraction / Processing: processing of food waste to get Collagen, Chitosan, Protein Hydrolysate, Bioactive peptides, Cosmoceuticals, Insecticides, enzymes, fertilizers, soil nutrients etc.

The food waste valorization could be seen as one of the examples and similar systems/ processes are being developed for wastes from other streams. We should work on enlightening fellow citizens on the importance of valorization of waste.

It is heartening to note that in response to Government of India policy on start up, there is good response for valorisation of waste. Some of the notable start-ups which use waste as a resource (raw material) are:

Vermigold: Vermigold is an on-site organic waste recycling Systems Company which combines advanced vermiculture biotechnology with cutting edge engineering to enable end users to Recycle organic waste in a trouble free and eco friendly manner.

Eco-wise: Headquartered at Noida, India. Ecowise waste management provides comprehensive waste management services to a variety of establishments including residential, commercial and industrial entities.

Synergy Waste Management (P) Ltd. :It is one of the leading service providers for Bio-Medical waste management in India. They are generally operators of Common Bio-medical waste treatment facilities, part of urban infrastructure in India.

Timarpur-Okhla Waste Management Pvt Ltd. : Timarpur-Okhla Municipal Solid waste management project is the first commercial waste-to-energy facility in India that aims to convert one-third of the Delhi garbage into the much needed electricity, enough to serving 6 lakh homes. The project is CDM is registered with United Nations Framework Convention on Climate Change for earning Carbon Credits.

Attero, Electronics Asset Management Company: Attero aims to increase value for all electronic inventories, right from end of life electronics to surplus and seconds electronics, while ensuring a safer and more secure future for the planet. It is mainly concerned with E-waste mining.

Antony Waste Handling Cell Pvt. Ltd. : Antony waste handling cell, is one of the leading players in the field of Solid waste management services in the country. It has features as Engineered Sanitary land filling., Refuse Transfer stations, etc.

UPL Environmental Engineers Ltd. : Shivalik Solid Waste Management Ltd. : this startup is providing services forTreatment, Storage and Disposal Facilities, Multiple effect evaporator, Empty used drums, Environmental monitoring and laboratory analytical services, Waste oil/used oil, Paint Sludge, e-waste and CFL, Used lead acid batteries and Waste water management consultancy.

Greenobin : It is a Gurgaon based startup that is focussed on collecting paper waste and market the same to paper recycling plants for further use.

GreenPowerSystems: It is a waste management technology firm. GPS custom builds units for an un-segregated waste ecosystem. The inaugural products, BioOrja and Biowaste Shredder, are arguably the first waste-to-energy solution for urban India.

Let's Recycle: It is an initiative of NEPRA Resource management Pvt. Ltd., a social enterprise that operates in segment of Dry Waste Management and Recycling, where it collects Dry Waste from Waste generators and segregates the recyclables and sends to authorized recyclers.

CONCLUSION

Waste valorisation is an attractive approach of increasing popularity which can offer a range of potentially useful alternatives for dealing with residues other than disposed or land filling. Valorising waste components could infact lead to numerous possibilities for the production of valuable chemicals, fuels and products that society currently does not appreciate.Basic valorisation strategies including composting, recycling and burning(for energy recovery) are largely accepted practises worldwide which however are able to recover or convert waste into useful products.Advanced valorisation strategies based on green chemical technologies are more appealing from both the practical, economic and sustainability view points in that these can diversify the generation of multiple products from a single feedstock.

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48. EXTERNALITY OF WATER POLLUTION AND ITS IMPACT ON HUMAN HEALTH

Dr.SURESH.B, Assistant Professor of Economics, J.K.K. Nataraja College of Arts& Science (Govt. Aided),Komarapalayam-638 183, MAIL: rbseconomics@yahoo.com CELL:9600614208.

ABSTRACT

Water is one of the natural resources which is essential to sustain life. Water pollution is any chemicals, physical or biological that changes the quality of water and has harmful effects on any living organism that uses it. When humans drink polluted water, it often has serious affects on their health. The objective of the study is 1) to evaluate the nature of the ground water in study area, 2) to study the Socio-economic characteristics of the respondents, 3) to examine the awareness of the respondents about the water pollution, and to find out the methods to control the ill effects of water pollution on human health.

The present study was conducted to assess the ill effects of water pollution on human health in Erumapalayam village in Salem District. Salem is the fifth largest city in Tamil Nadu State. A sample of 50 respondents was selected through simple random sampling techniques. The data was collected through well structured interviewing schedule. The collected data was analyzed by using descriptive and inferential statistics. The physical and chemical analysis conducted the water sample, it is found that the appearance of samples is slight-brownish color and they have objectionable odour and taste, Turbidity of the samples is found to be not in the range of permissible limit, I.e., 36 mg/L. As per the standard of Central Public Health Engineering Environmental Organization (CPHEEO) water sample is physically and chemically not potable due to appearance of odour and TDS, ALK, TH, FE, NO3 and C1 value exceeds the maximum permissible limits.

KEYWORDS: Pollution, Human Health, Awareness

INTRODUCTION

Water pollution is any chemicals, physical or biological that changes the quality of water and has harmful effects on any living organism that uses it. When humans drink polluted water, it often has serious affects on their health. Water pollution can also make water unsuited for the desired use. A little negligence on the part of civic bodies can result in the spread of many diseases. Access to safe drinking water remains an urgent necessity, as 30% of urban and 90% of rural households still depend completely on untreated surface or groundwater. While access to drinking water in India has increased over the past decade, the tremendous adverse impact of unsafe water on health continues. It is estimated that about 21% of communicable diseases in India is water related. A majority of inland rivers which are the sources of drinking water in urban India are also contaminated. While the shift in usage from surface water to groundwater has undoubtedly controlled microbiological problems in rural India. The same has however, led to newer problems of fluorosis and arsenicosis. Excess iron is an endemic water quality problem in many parts of eastern India. Hardness is mainly caused by the presence of carbonate, bicarbonate, choloride and sulphate salts of calcium and magnesium in water. Iron is found in parts of Madhya Pradesh, Uttar Pradesh, Coastal Orissa, Andhra Pradesh and Tamil Nadu.

THEORETICAL BACKGROUND OF THE STUDY

Environmental pollution is an 'externality' in welfare economics. An externality is present whenever individual A's utility and production relationships include real (i.e. non-monetary) variables, whose values are chosen by others (persons, corporations, governments) without particular attention to the effects on A's welfare. An externality can be either beneficial (positive) or harmful (negative). Examples of beneficial externalities are, a neighbour's rose garden entering as a real variable in the utility functions of others living in the neighbourhood, and services of a lighthouse entering as a real variable in the production function of shipping companies. Negative externalities include noise pollution by aircrafts using an airport, which enters as a real variable in the utility functions of persons living in the neighbourhood, and the pollution of a river, which enters as a real variable in the production function of water-supply undertakings drawing from the river or agriculture. With this background, the present study has also been undertaken to assess the impact of polluted water on the health status of the Erumapalayam village in Salem District.

OBJECTIVES

1.To study the Socio-economic characteristics of the respondents

2.To examine the awareness of the respondents

about the water pollution
3.To find out the methods to control the ill effects of water pollution on human health.

METHODOLOGY

The present study was conducted to assess the ill effects of water pollution on human health in Erumapalayam village in Salem District. Salem is the fifth largest city in Tamil Nadu State. A sample of 50 respondents was selected through simple random sampling techniques. The data was collected through well structured interviewing schedule. The collected data was analyzed by using descriptive and inferential statistics.

RESULT AND DISCUSSION

PHYSICAL CHARACTERIZATION

From the study area physical and chemical analysis conducted the water sample, it is found that ground water sample which are taken within ½ km from the solid waste dumping site are unfit for drinking purpose. The appearance of samples is slight-brownish colour and they have objectionable odour and taste, Turbidity of the sample is found to be not in the range of permissible limit i.e., 36mg/lit. Turbidity in water is caused by suspended matter such as clay, silts, finely divided organic and inorganic matter, soluble coloured organic compounds and plankton and other microscopic organisms. As per the standard of Central Public Health Engineering Environmental Organization (CPHEEO) water sample is Physically and chemically not potable due to appearance of odour and TDS, ALK, TH, Fe, No3 and C1 value exceeds the maximum permissible limits. The Total Dissolved Solids, PH, Electrical Conductivity, Chloride. Total Hardness, Nitrates (No3) and Fluoride contents are higher than the maximum limits. The following table 1 shows the physical and chemical characteristics of ground water quality at Erumapalayam village in Salem.

Table: 1 Physical and Chemical Characteristics of Ground Water in Salem

Parameters	Acceptable Limit	Rejection	Results of the Sample
Physical Examination	(A)	(B)	
Appearance	-	-	Sli.brownish
Colour (Pt.CoScale)	5	25	-
Odour	Unobjectionable	-	Objectionable Odour
Turbidity NT units	2.5	10	36
Total Dissolved Solids mg/ lit	500	2000	4283
Electrical Conductivity micromho/cm	-	-	6140
Chemical Examination			
PH	7.0-8.5	6.5-9.2	`6.91
Iron (Fe)	0.1	1.0	2.8
Total Alkalinity	-	600	2.8
Total Hardness as CaCo3	200	600	964
Nitrate as No3	46	100	2240
Chloride as C1	200	1000	155
Fluoride as F	1.0	1.5	1.0
Sulphate as SO4	200	400	110

(A) CPHEEO (Central Public Health Engineering Environmental Organization) Standards-Acceptable Limit
(B) CPHEEO Standards- Cause of rejection when exceed Result of Chemical Examination are expressed in mg/lit Acceptable limit fro Mg can go upto 125 mg/lit with and allowance of 1 mg per 25 mg so4

The analysis of water samples reveals that the quality of ground water in the solid waste dumping site are affected and the ground water from these nearer sites are not fit for human

consumption.

Distribution of the respondents with regard to their age, education and income has been given table 2. Majority of the respondents (50%) said that the main reason of water pollution was solid waste dumping and bad sewage system. Majority (50%) respondents were not satisfied with the quality of water that they drink.

Table: 2

Distribution of the respondents with regard to their Age, Education and Income

Age (in years)	Frequency	Percentage
Below- 20	4	8
31-40	6	12
41-50	11	22
51-60	22	44
61-Above	7	14
Education of Respondents		
Illiterate	10	20
Primary	16	32
High School	17	34
HSC	4	8
Degree	3	6
Monthly income of the Respondents		
Less than-2000	9	12
2001-3000	6	12
3001-4000	2	4
4001-5000	7	14
5001-6000	7	14
6001-7000	11	22
7001-Above	8	16
Total	**50**	**100**

Source: Primary Data

Majority of the respondents (74%) replied that some members of their family suffered from any disease due to polluted water and (26%) said that none of their family member suffered from any disease due to polluted water. Distribution of the respondents according to the type of disease they suffered due to polluted water is given in table 3.

Table: 3

Distribution of the respondents according to the type of disease *(Source : Primary Data)*		
Type of Diseases	**Frequency**	**Percentage**
No disease	13	26
Diarrhoea	3	6
Cholera	2	4
Hepatitis	10	20
Typhoid	4	8
Skin disease	3	6
Common Cold	13	26
Viral Fever	2	4
Total	**50**	**100**

Table: 4
Association between Education of the respondents and their awareness about Water Pollution

(Hypothesis 1: Higher will be the education, higher will be the awareness about water pollution)

Education Level	Awarness about Water Pollution		Total
	NO	YES	
Illiterate	6(12%)	4(8)	10(20%)
Primary	4(8%)	12(24%)	16(32%)
Secondary	1(2%)	16(32%)	17(34%)
HSC	0	4(8%)	4(8%)
Degree	0	3(6%)	3(6%)
Total	**11(22%)**	**39(78%)**	**50(100%)**

Source: Primary Data X2=15.680 d.f.=1 Significance=.000 *= Significance

The Chi-Square value shows a significant association between education of the respondents and their awareness about water pollution. Chi-Square=15.680with 1 degree of freedom and it is statistically significant. It means highly educated respondents had more awareness about water pollution. So the hypothesis "higher will be the education, higher will be the awareness" is accepted.

Table: 5
Association between income of the respondents and their awareness about Water pollution

(Hypothesis 2: Higher will be the income, higher will be the awareness about water pollution)

Income (Rs.)	Awarness about Water Pollution		Total
	NO	YES	
Below-2000	7(14%)	2(4%)	9(18%)
2001-3000	1(2%)	3(6%)	4(8%)
3001-4000	2(4%)	1(2%)	5(10%)
4001-5000	1(2%)	5(10%)	6(12%)
5001-6000	0	8(16%)	8(16%)
6001-7000	0	10(20%)	10(20%)
7001-Above	0	10(20%)	10(20%)
Total	**11(22%)**	**39(78%)**	**50(100%)**

Source: Primary Data X2=15.680 d.f.=1 Significance=.000 *= Significance

The Chi-Square value shows a significant association between income of the respondents and their awareness about water pollution. Chi-Square=15.680 with 1 degree of freedom and it is statistically significant. It means higher income respondents had more awareness about water pollution. So the hypothesis "higher will be the income, higher will be the awareness" is accepted.

CONCLUSION

The water pollution should be included in the national curriculum for creating awareness about the benefits of body water and all effects of poor quality water on human health. Mass media can play vital role to create awareness among the public about the problem of water pollution. Social workers, local government and leaders should be involved to seek greater public participation in seminars and workshops about awareness of water pollution in rural areas. The programmes on T.V. and radio should be presented in easy languages so that illiterate persons may also get awareness about water pollution.

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49. EFFECTS OF CLIMATE CHANGE ON DISTRIBUTION, FRESHWATER RESOURCES AND THE ECONOMY - A THEORITICAL ASSESSMENT

Dr. G. YOGANANDHAM, Associate Professor, Department of Economics, Thiruvalluvar University, Serkadu, Vellore, Tamil Nadu.

ABSTRACT

Climate Change reveals the multi dimensional spheres of economic impact on the developing economy. The inherent nature of economic forecasting involves significant degrees of uncertainty, estimates of the results of global warming have varied widely.

However, climate change impacts can be measured as an economic cost. This is particularly well-suited to market impacts, that is impacts that are linked to market transactions and directly affect Gross Domestic Product. Monetary measures of non-market impacts, like impacts on human health and ecosystems, are more difficult to calculate. Therefore protecting the forests, wildlife, climate, natural wealth and the environment are now a matter of life and death for this world. Talented, imaginative and committed young professional are needed more than ever to create a future where people can live in harmony with nature. Show that professionals are concerned and contribute their share to safe guard the climate and environment. Hence, the main objective of this research paper is to study the theoretical aspects of the effects of climate change on humans, industry, economy and society.

KEYWORDS: Climate and Environment, Economic Impact, Economic Forecasting, Stern Review, Developing Economy, Uncertainty and Climate Models, Agricultural Market Sector.

INTRODUCTION

Climate Change reveals the multi dimensional spheres of economic impact on the developing economy. The inherent nature of economic forecasting involves significant degrees of uncertainty, estimates of the results of global warming have varied widely. Several Studies, such as that of the Stern Review presented to the British Government, have predicted reductions by numerous percent of world gross domestic product due to climate related costs such as dealing with increased extreme weather events and stresses to low-lying areas due to sea level rises. Other studies by independent economists looking at the effects of climate change have found more ambiguous results around the range of net-neutral changes when all aspects of the issue are evaluated, though the issue remains intensely debated.

CLIMATE CHANGE AND ITS IMPACT ON DISTRIBUTION

Climate change impacts can be measured as an economic cost. This is particularly well-suited to market impacts, that is impacts that are linked to market transactions and directly affect Gross Domestic Product. Monetary measures of non-market impacts, like impacts on human health and ecosystems, are more difficult to calculate. Other difficulties with impact estimates are,

- **Knowledge gaps:** Calculating distributional impacts requires detailed geographical knowledge, but these are a major source of uncertainty in climate models.
- **Vulnerability:** Compared with developed countries, there is a limited understanding of the potential market sector impacts of climate change in developing countries.
- **Adaptation:** The future level of adaptive capacity in human and natural systems to climate change will affect how society will be impacted by climate change. Assessments may under- or overestimate adaptive capacity, leading to under- or overestimates of positive or negative impacts.
- **Socioeconomic trends:** Future predictions of development affect estimates of future climate change impacts, and in some instances, different estimates of development trends lead to a reversal from a predicted positive, to a predicted negative impact.
- Climate change would increase income inequalities between and within countries.
- A small increase in global mean temperature would result in net negative market sector impacts in many developing countries and net positive market sector impacts in many developed countries.

With high confidence, it was predicted that with a medium to high level of warming, negative impacts would be exacerbated, and net positive impacts would start to decline and eventually turn negative.

NON-MARKET IMPACTS

The climate change would likely result in pronounced non-market impacts. Most of impacts were predicted to be negative. The literature assessment suggested that climate

change would cause substantial negative health impacts in developing countries. Smith noted that few of the studies they reviewed had adequately accounted for adaptation. Based on the literature assessment, the studies that had included health impacts, those impacts contributed substantially to the total costs of climate change.

CLIMATE CHANGE AND ITS IMPACT ON FRESHWATER RESOURCES

In this sector, costs and benefits of climate change may take several forms, including monetary costs and benefits, and ecosystem and human impacts, like loss of aquatic species and household flooding. These costs had been estimated in monetary terms. In respect to the water supply, they predicted that costs would very likely exceed benefits. Predicted costs included the potential need for infrastructure investments to protect against floods and droughts.

CLIMATE CHANGE AND ITS AGGREGATE IMPACTS

Aggregating impacts adds up the total impact of climate change across sectors and/or regions. In producing aggregate impacts, there are a number of difficulties, such as predicting the ability of societies to adapt climate change, and estimating how future economic and social development will progress. It is also necessary to make subjective value judgements over the importance of impacts occurring in different economic sectors, in different regions, and at different times.

The aggregate impacts of climate change. With medium confidence, a small increase in global average temperature would result in an aggregate market sector impact of plus or minus a few percent of world GDP. A small to medium global average temperature increase, some studies predicted small net positive market impacts. Most studies they assessed predicted net damages beyond a medium temperature increase, with further damages for greater temperature rises.

The non-market impacts of climate change would be negative. decided that studies might have understated the true costs of climate change, like by not correctly estimating the impact of extreme weather events. It was thought possible that some of the positive impacts of climate change had been overlooked, and that adaptive capacity had possibly been underestimated.

REVIEW OF LITERATURE

Goklany (1995) concluded that promoting free trade through the removal of international trade barriers could enhance adaptive capacity and contribute to economic growth.

Fankhauser et al. (1997) and Azar (1999) found that greater concern over the distribution of impacts lead to more severe predictions of aggregate impacts.

Pearce (2003) argued that where there are monetary costs of avoiding impacts, it is not possible to avoid monetary valuation of those impacts.

Hope (2005), Analysed that uncertainty over climate sensitivity affects economic estimates of climate change impacts. The uncertainty over the climate sensitivity was the most important factor in determining the social cost of carbon an economic measure of climate change impacts.

Channing Arndt, Adam Schlosser, Kenneth Strzepek, James Thurlow (2014), evaluates the potential implications of climate change for overall growth and development prospects in Malawi. We combine climate, biophysical and economic models to develop a structural analysis focused on three primary impact channels: agriculture, road infrastructure and hydropower generation. We account explicitly for the uncertainty in climate forecasts by exploiting the best available information on the likely distribution of climate outcomes.

Samuel Fankhauser and Nicholas Stern (2016), Climate change is not the only environmental problem we face, nor is it the only threat to global prosperity. But climate change is unique in its magnitude and the vast risks it poses. It is a potent threat multiplier for other urgent concerns, such as habitat loss, disease and global security and puts at risk the development achievements of the past decades. If unchecked, climate change could fundamentally redraw the map of the planet, and where and how humans and other species can live.

Channing Arndt, Finn Tarp (2017), Aid and aid institutions constitute an important element of the global response to interlinked global developmental and environmental challenges. As such, these institutions are now being drawn into new arenas beyond the traditional focus on improving the livelihoods of poor people in low-income countries.

METHODOLOGY

The methodology adopted for the study is purely depends on secondary theoretical information obtained from various sources like published and unpublished reports in India and the World. The secondary sources of information were further processed and consolidated suitably for the purpose of analysis. Finally, keeping the objective of the research paper in mind, the paper was written in lucid language and easy understanding.

ECONOMIC EFFECT OF CLIMATE CHANGE

Losses accelerate with greater warming, and estimates diverge. The new estimates have slightly widened the uncertainty about the economic impacts of climate. Welfare impacts have been estimated with different methods, ranging from expert elicitation to econometric studies and simulation models. Different studies include different aspects of the impacts of climate change, but no estimate is complete; most experts speculate that excluded impacts are on balance negative. Estimates across the studies reflect different assumptions about inter-sectoral, inter-regional, and inter-temporal interactions, about adaptation, and about the monetary values of impacts. Aggregate estimates of costs mask significant differences in impacts across sectors, regions, countries, and populations. Relative to their income, economic impacts are higher for poorer people.

MARGINAL IMPACTS

The Social Cost of Carbon (SCC) is an aggregate measure of the impacts of climate change. It is defined as the incremental or marginal social cost of emitting one more tonne of carbon as carbon dioxide into the atmosphere at any point in time. Different GHGs have different social costs. For example, due to their greater physical capacity to trap infrared radiation, have a considerably higher social cost per tonne of emission than carbon dioxide. Another physical property that affects the social cost is the atmospheric lifetime of the GHG.

SENSITIVITY ANALYSIS

Sensitivity analysis allows assumptions to be changed in aggregate analysis, the results of the aggregate analysis are,

- Shape of the damage function: This relates impacts to the change in atmospheric Green House Gas (GHG) concentrations. There is little information on what the correct shape like linear or cubic of this function is. Compared with a linear function, a cubic function shows relatively small damages for small increases in temperature, but more sharply increasing damages at greater temperatures.
- Rate of climate change: This is believed to be an important determinant of impacts, often because it affects the time available for adaptation.
- Discount rate and time horizon: Models used in aggregate studies suggest that the most severe impacts of climate change will occur in the future. Estimated impacts are therefore sensitive to the time horizon and the discount rate the value assigned to consumption in the future versus consumption today.
- Welfare criteria: Aggregate analysis is particularly sensitive to the weighting of impacts occurring in different regions and at different times.
- Uncertainty: Usually assessed through sensitivity analysis, but can also be viewed as a hedging problem.

ADVANTAGES AND DISADVANTAGES OF CLIMATE CHANGE

Smith et al., (2001) revealed that there are a number of benefits of using aggregated assessments to measure climate change impacts. They allow impacts to be directly compared between different regions and times. Impacts can be compared with other environmental problems and also with the costs of avoiding those impacts. A problem of aggregated analyses is that they often reduce different types of impacts into a small number of indicators. It can be argued that some impacts are not well-suited to this, like the monetization of mortality and loss of species diversity.

RELATIVE IMPACTS

The effects of climate change can be compared to other effects on human society and the environment. Future socio-economic development may strongly affect climate change impacts. For example, projections of the number of people at risk of hunger vary significantly according to assumptions over future socio-economic development.

Some ecosystems are likely to be especially affected by climate change. In the long-term, climate change may become the major driver for biodiversity loss globally.

The socio-economic impacts of climate change are likely to be greatest in communities that face other stresses. For example, poor communities are vulnerable to extreme weather events, and are likely to be especially affected by climate change. In general, however, other changes like demographic and technological are likely to have a greater effect on human society than climate change. On the other hand, major non-marginal impacts could occur with abrupt changes in natural and social systems.

Another consideration is how vulnerability to climate change varies with scale. At local scales, extreme weather events can have a significant impact, especially in vulnerable locations. Another potentially significant impact is the long-term effect of sea-level rise on low-lying coastal areas.

CLIMATE INDUCED CONFLICTS AND CLIMATE INDUCED MIGRATION

The Stern Review's figures tend to be at the upper end of the scale compared to

other estimates currently circulating, even its quantitative estimates fail to include the economic upheavals that would arise as a consequence of climate-induced conflicts or might be triggered by climate-induced migration.

Several analysts have emphasized the importance of catastrophic risks because of climate change. Due to climate change, significant impairment of the global economy is a distinct possibility.

CONCLUSION

Overall, the adaptation costs for climate change, including for developing countries. They have similar-sized estimates and have been influential in discussions on this issue. However, this issues have a number of deficiencies which need to be transparent and addressed more systematically in the future. In some parts of the world low levels of investment have led to a current adaptation deficit, and this deficit will need to be made good by full funding of development, without which the funding for adaptation will be insufficient. Residual damages also need to be evaluated and reported because not all damages can be avoided due to technical and economic constraints. There is an urgent need for more detailed assessments of these costs, including case studies of costs of adaptation in specific places and sectors.

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50. ECONOMIC VALUATION OF HOSPITAL WASTE MANAGEMENT

Dr. N.YASOTHA, Head & Associate Professor, Department of Economics, Salem Sowdeswari College, Salem-10

ABSTRACT

Bio- Medical Wastes have become one of the most widespread and important environmental and public health issues and present day concern throughout the globe and as such, the problem has been recognized as one of the important issues towards abatement of pollution in the country along with the rest of the world. The main thrust of the present study is to evaluate the willingness to pay with specific reference to solid waste management in Hospitals. The study has analyzed three hospitals in the Chennai area, in Tamil Nadu. The main method of disposal of hazardous wastes is through incineration and this has been studied with regard to the Government and Private Sectors through the selected hospitals, by way of life expectancy of equipment probable use per day/per kg, cost of operation per day/kg and ultimately the WTP by those availing of these facilities have all been carefully researched.

KEY WORDS: Hospital Waste, Contingent Valuation Method, Willingness to Pay.

INTRODUCTION

Bio- Medical Wastes have become one of the most widespread and important environmental and public health issues and present day concern through out the globe and as such, the problem has been recognized as one of the important issues towards abatement of pollution in the country along with the rest of the world.

Hospital Waste Management is and important subject that needs urgent attention. It is appropriate to consider an incremental approach realizing that an improvement is of great value even if resources do not allow achievement of highest standards immediately (S.Chandrashekarshetty, 2001).

There are many examples and ample evidences that improper and unscientific disposal of hospital and bio-medical wastes can cause serious damage to health and environmental. Protection of health and environment is a challenging problem of this county. Environmental pollution is detrimental to human health as people and environment are interconnected (David. W. Pearce, 1993). Hospitals and dispensaries are rapidly increasing due to continuously degrading environment. However, hospitals themselves generate large quantities of Bio-Medical Waste which is a complex mixture containing infectious, chemical, pharmaceutical and radioactive wastes that can pose health and safety hazards due to its infective and toxic characteristics. As a result there is a growing concern among public and civic bodies about storage, treatment, transportation and ultimate disposal of BMW (WHO, 1999) (A. Pruss, et al., 1999).

All producers of waste are legally and financially responsible for the safe and environmentally sound disposal of the waste they produce as per the polluter pays principles. This principle also attempts to assign liability to the party that causes the damage. The costs of separate collection, appropriate packaging and on-site handling are internal to the establishment. The cost of off-site transport, treatment, and final, disposal is external and paid to the contractors who provide the service. The cost of contraction, operation and maintenance of system for managing health-care waste can represent significant part of the overall budget of a hospital or health-care establishment (A.Pruss et al., 1999). However several hospitals are generally small or medium sized and cannot afford to install expensive treatment plants due to various economic constraints.

Bio-Medical Wastes Management has been a neglected subject in India. Recently, the government of India (GOI) has promulgated the Bio-Medical Waste (Management and Handling) Rule in July 1998. As per the GOI Rules, Bio-Medical Wastes have been classified into 10 categories (Ministry of Environment Forests Notification 1998).

Most importance is medical waste to be managed in an environmentally sound manner. Environmentally sound management of the medical waste requires proper understanding of risks associated with the disposal of such wastes, and methods of proper segregation, storage, handling treatment and disposal. Collection, transportation and final disposal of large volumes of wastes require a high level of management and technical expertise. There is also a rising public awareness about the need for an environmentally acceptable

management of solid wastes. The final disposal of solid wastes can be carried out by several methods incineration, composting, land filling and recycling certain hazardous wastes such as hospital wastes which of course, should be positively incinerated (P.R. White, et al., 1995).

STATEMENT OF THE PROBLEM

In recent years the mismanagement of hospital waste has become critical in urban areas. In addition to transmission of communicable diseases such as gastro-enteric infections, respirator infections through air, water, direct human contact with the blood and infectious body fluids could be responsible for transmission of hepatitis B and C and AIDS in the metropolitan cities (P. Rushbrook, 1999). The waste generated in these institutions essentially comprises solid and liquid waste estimated to be 80-85% of the waste generated in the hospitals and are not hazardous, while the rest is hazardous or likely to cause infections (Lakshmi Raghupathy, 1998). The waste generated in ay hospital will be in the range of 1 to 4.5 kg per bed per day (R.Murali, 1999). The wastes generated from hospital and medical health institutions are a major source of environmental and public health problems thus requiring safe handling and secure disposal.

SCOPE OF THE STUDY

The study is an attempt to have a close look at the hospital waste management and also the need to protect the environment. It is broadly based on people's participation and promotion of Chennai Hospital Waste Management Systems. This study also attempts 'Valuing the Environment" to measure the individual's preference for environmental improvement and hospital waste management for the future. The study also suggests a constructive view on social choices in the context of economic development

MATERIALS AND METHODS

The methodology used in this study has been the survey method through an interview schedule which has been pilot tested and administered to 300 respondents selected through random stratified method of sampling i.e. 100 respondents have been stratified as patients in owed out staff including nurses, doctors, attendees, and relatives and who those living in and around the surrounding locality all have been included for testing.

The economic value of hospital waste management is measured by the summation of many individuals willingness to pay for environmental preservation or bargains for immediate monetary needs. Thus this WTP reflects individuals' preferences for the good in question. So economic valuation in the environment context is about 'measuring of preferences' of people for an environmental good or bad. The resulting valuations are in money terms because of the way, in which preference revaluation is sought i.e., by asking what people are willing to pay or by inferring their WTP through other means. Moreover the use of money as the measuring rod permits the comparison i.e., required between 'Environmental Values' and 'Developmental Values'. It can be used to derive values for almost any environmental changes and the pestering needs.

The Contingent Valuation method is a widely used economic valuation method especially in the area of non-market valuation of environmental services and damages (Mitchell and Carson, 1989; Cummings et al., 1986). Its application includes estimation of non-use values. (Walsh et al., 1984; Brookshire et al., 1983), non-market use values (Choe et al., 1996; Loom is and du Vair 19993; Altaf et al., 1992; Whittington et., 1990; Coursey et al., 1987; Grenley et al., 1981; Schulze et al., 1981; Randall et al., 1974) or both (e.g. Niklitschet and Leon 1996; Desvousges et al., 1993) of environmental damages.

The main thrust of the present study is to evaluate the willingness to pay with specific reference to solid waste management in Hospitals. The study has analyzed three hospitals in the Chennai area, in Tamil Nadu, India and has interviews 300 respondents, 100 from each area, of Government General Hospital (GH) Park Town, Govt. Kasthuriba Gandhi Hospital, Triplicane and Malar Hospital, Adyar. These hospitals contain a total number of 2029, 700 and 250 beds repectively. The study has revealed that both GH and Malar Hospital have installed incinerators with cost effect of Rs. 1.24/kg/day and Rs. 13.6/kg/day respectively. The Malar Hospital seems to have installed an incinerator of 15 kg/h capacity for cost of Rs. 15 lakhs The main method of disposal of hazardous wastes is through incineration and this has been studied with regard to the Government and Private Sectors through the selected hospitals, by way of life expectancy of equipment probable use per day/per kg, cost of operation per day/kg and ultimately the WTP by those availing of these facilities have all been carefully researched.

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RESULTS AND ANALYSIS

The study has shown that there is willingness to pay up to Rs. 250/- starting from Rs. 50/- i.e.

a range of Rs. 200/- the mode rests with the Rs. 100/- category. Those interviewed in a majority were willing to pay 228 persons (76%) for infrastructure facility and their improvements. Years ago, the practice in hospitals was to collect a certain amount towards bed charge/ room rent, which would include the nursing service charges. But at present the hospitals are levying separate nursing charges etc. Hence a comprehensive policy on what amount should be charged for each of the facilities offered should be formulated. This could be done through committees especially constituted for this purpose, having economic and cost accounting experts as also lawyers, doctors and other professionals, and should include at least a coupe of members of the general public. This democratic approach to problem solving would go a long way in eradicating the various skills that seem to besiege official planning especially with regard to hospital waste management.

CONCLUSION

The study has shown immense scope for innovation and improvement. There are ancillary topics such as liquid and other waste which need to be studied with regard to WTP. There are other organizations such as hotels, air, rail and bus terminals, cinema halls and other places where the public congregate and where wastes generated. The economic valuation of these areas provides further scope for research. WTP itself could be further researched form the angles of toll/tax/service charge/donations with tax exemptions. All experience is an arch, where through gleams the untraveled world, whose margin fates for ever and ever as one moves on.

In conclusion the following points are stated as possible guidelines for hospitals to bear in mind for future action.

1.The government authorities have to assume more responsibilities for regulating waste generated form health facilities. In addition to formulating guidelines and rules and regulation the focus should be on enforcing the guidelines.
2.The health care facilities should increase the cooperation with professional medical associations and MoEF, CPCB municipalities for the development and implementation of environmentally responsible standards for medical waste treatment and disposal.
3.Encouraging recycling efforts leading to the segregation of infections and hazardous waste form the conventional waste streams with the goal of reducing the amount of medical waste that need to be incinerated.
4.Encourage the phasing out and elimination of medical supplies made of PVC plastics or containing mercury where alternatives are available.
5.Consider the entire issue of medical waste disposal in the overall public health perspective. A total new integrated approach is required.
6.Look into the possibilities of better product purchasing and substituting the hazardous materials that are currently used.
7.Assume greater responsibility for decreasing environmental toxicants principally dioxin and mercury components and exposure form medical sources.
8.Waste containers must be secured to deny access to unauthorized individuals, and must be marked with warning signals in local language.
9.Sharps must be contained in secure, leak proof, rigid puncture resistant containers. Hypodermic needles and syringes must be separated and stored to prevent reuse.
10.All disposable bags must be conspicuously labeled “Infectious Wastes” or “Biohazard” with the international symbol.

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