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Chairman's Speech

Climate change is one of the most important global environmental challenges, with implications for food production, water supply, health, energy, etc. Addressing climate change requires a good scientific understanding as well as coordinated action at national and global level.

The most effective way to address climate change is to adopt a sustainable development pathway by shifting to environmentally sustainable technologies and promotion of energy efficiency, renewable energy, forest conservation, reforestation, water conservation, etc.

I congratulate Principal Dr.Usha Iyer and her team for putting forth such a relevant issue and organizing this International Conference.

I am extremely happy to have the presence of Dr. Priyadarshini Karve, Managing Director, of Samuchit NGO and Dr. Ram Boojh the Program Chief, Natural Sciences of UNESCO, New Delhi amidst us as speakers for the day. I am sure that there would be brain storming sessions and deliberations contributing to a positive outcome of the conference by way of creating awareness among the public on Climate change and its impact.

On behalf of SIWS College Management, Principal, Staff and students, I have the honour of declaring the International Multi-disciplinary Conference on **'Climate Change, Environment and Sustainable Development in a Global Economy', Open.**

Thank You.

Dr. V. Rangaraj
Chairman,
S.I.W.S. Managing Committee,
Wadala, Mumbai

Theme of the Conference

Climate change is a global challenge today. Countries all over the world are experiencing significant repercussions of global warming and climate change, which include rising temperature, rising sea level, and more extreme weather events. The greenhouse gas emissions from human activities are the major cause for climate change. Emissions anywhere affect people everywhere. Without action, the world's average surface temperature is projected to rise over 3 degrees Celsius in this century, with some areas of the world expected to warm even more. The most vulnerable and the poorest people are being affected the most. It is absolutely essential that countries of the world join handsand take measures to move towards a low-carbon economy.

The call of the United Nations to address the issue of climate change resulted in the countries adopting the **Paris Agreement** at the COP21 in Paris on December 12, 2015. The Agreement came into effect on November 4, 2016. In the Agreement, all countries agreed to work to limit global temperature rise to well below 2 degrees Celsius, and given the grave risks, to strive for 1.5 degrees Celsius.

The ecological consequences of global warming are loss of biodiversity, deforestation, desertification and decreasing natural resources which have an impact on development issues, food and water supply, diseases, migration etc. As a consequence, poverty increases and conflicts over natural resources will be on the rise. Environmental issues have to be taken into account in the process of economic development. Sustainable development should be grave concern in all fields affecting development such as trade policy, foreign policy or economic policies.

Implementation of the Paris Agreement is essential for the achievement of the Sustainable Development Goals(SDGs) that provides a roadmap for climate actions which will reduce emissions and build climate resilience. International trade should promote sustained growth and inclusive development. Developed and developing countries should take advantage of emerging opportunities for trade associated with the protection, promotion and preservation of the environment and sustainable development objectives. There is a need to address climate change implications by promoting climate-friendly trade and production strategies.

Environmental Degradation and Climate Change - The uneven economic growth and social progress over the last decades have been accompanied by mounting environmental pressures and reduction of natural resources. According to United Nations Development Program (UNDP), between 1990 and 2010, for instance, natural capitalviz. the global stock of natural resources and assets, declined in 127 of the 140 countries. Some of the main underlying factors behind environmental degradation include population growth, polluting technologies and overexploitation of ecosystems driven by unsustainable consumption and production patterns. The growing global middle class with higher consumption levels, as well as urbanization dynamics, put pressure on agriculture and industry needs.

The accelerated climate change exacerbates the damage to ecosystems and harmful effects on human livelihoods. It is now widely recognized that the causes of environmental degradation and climate change and their potential solutions are essentially linked to human activity. It is widely acknowledged that economies cannot continue to grow with the same consumption and production patterns. The UNDP has estimated that between 1950 and 2010, while the global population increased almost threefold, the use of natural resources, including biomass, fossil

fuels, ores, minerals and water, increased sevenfold. This significant increase in resource use has also led to increasing waste and emissions and growing environmental impact. If the current patterns of consumption and production remain unaltered, by 2050 the global use of natural resources will reach four times the amounts of 2010. Such quantity of resources is currently not available and is unlikely to be affordable, and also risks potential damage to natural and human systems.

Sustainable Development Goals - The impact of human activity on environment and climate can potentially undermine progress on sustainable development, including eradication of poverty and reduction in inequalities. Recognizing this, the 2030 Agenda sees climate change as a cross-cutting issue and includes important commitments related to environmental sustainability that feature in five dedicated Sustainable Development Goals as well as in targets related to several other goals. The adoption of the Paris Agreement, the first universal binding global climate agreement, in 2015 by 195 member states of the United Nations, presents an important call for action towards a low-carbon economy and shows the commitment of countries to reduce greenhouse gas emissions and support adaptation efforts.

The Sustainable Development Goals (SDGs), known as the Global Goals, are a universal call of action to end poverty, protect the planet and ensure peace and prosperity for all the people around the globe. These 17 Goals built on the success of the Millennium Development Goals, include new areas such as climate change, economic inequality, innovation, sustainable consumption, peace and justice. They provide clear guidelines and targets for all countries to adopt in accordance with their own priorities and the environmental challenges of the world at large.

This calls for mobilizing sufficient finance for climate adaptation and mitigation as well as ensuring sustainable and resilient infrastructure by the countries of the world. Climate change should be addressed through eco-social policies accompanied by a normative to shift towards achieving ecological and social objectives in development strategies. The policymakers should aim at providing an environment for social innovation, including behavioural change that aims at protecting the environment.

The conference will focus on the challenges imposed by global warming and climate change and its impact on environment and how environmental policies have to change to meet the goals of the Paris Agreement and promote sustainable development.

Dr. Usha Iyer
Chairperson of the Conference
Principal and Head,
Department of Business Economics,
S.I.W.S. College,
Wadala, Mumbai

April 10, 2018

Speakers's Speech

The definition of 'sustainability' has been given in a variety of ways. 'Sustainability helps us to study how natural systems function, remain diverse and produce everything it needs for the ecology to remain in balance', is one of the popular explanation of this much used term. Thought is always given to progress and development, but then the sustainability hampers. The sustainable growth is an impossible theorem. Whenever, there is development, there is going to be loss of natural resources. The life style of affluent class utilizes large amount of valuable resources. There are countless examples throughout human history where civilization has damaged its own environment and seriously affected its own survival chances. The conflict, communal riots, the wars and terrorism adds to the man-made disasters which further hampers the sustainability. Sustainability takes into account how we might live in harmony with the natural world around us, protecting it from damage and destruction.

Thus, it is thought that in every-day life of a common citizen, sustainability practices can be adopted. In all our actions, thoughts, expression and behavior if we think of a way to achieve sustainability, it will save the mankind from the hazardous impact of our own actions. If we have to consider about the future then we need to make the decisions about the present.

The Brundtland commission defines sustainable development as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Based on this view, in 2005, the World Summit on Social Development identified three pillars of sustainable development. These are core areas that contribute to the philosophy and social science of sustainable development. They are economic development, social development and environmental protection. Out of this on individualistic level, one could always focus on environmental protection as one of the major area and thereby help in the protection and conservation of the environment around us.

The United Nations Conference on Sustainable Development had given the Millennium Development Goals (MDG) in 2000, which later were modified into SDGs in 2015. The SDGs or Sustainable Development Goals has a list of 17 items which included four broad categories, viz. social, economic, and environmental and governance. Based on this framework, the sustainable development framework can be formed for each individual.

The principles of sustainability for such survival necessarily includes protecting nature, thinking long term, understanding the systems within which we live, recognize limits, practicing fairness and embracing creativity. When these principles are followed, the happiness is inevitable. The countries that have very high GNH (Gross National Happiness) seem to follow the same path of the above principles.

The individual indicators which can be practiced are as follows:

- **Water**: Water consumption is judicial, use of polluting materials, detergents, cleaners, toxics are avoided.
- **Energy**: Solar and wind energy will be used for making electricity. Use of solar devices at home is possible. The fuel consumption, CO_2 budget and the wastage of energy will never be done.
- **Transport**: Use of public transport use, whenever the conditions to commute singly arises, the carpooling can be done, use of bicycle, preference to walking
- **Food**: Purchases of fast food should be discontinued, organic and fair trade food should be preferred. Vegetarian food is always ecologically a better alternative.
- **Clothing**: Number of sarees, shirts, dresses, shoes, expenditures on clothes and other accessories.
- **Housing**: number of rooms per person, cost, second home, décor whether it is eco-friendly.
- **Technology**: number of electronic devices bought/discarded, dependence on such devices.
- **Hobbies**: Contact with nature, animals (hours per week), any conservation activities undertaken.
- **Travel**: for recreation, tourism (km) Experiences of beauty, cultural diversity
- Community participation in activities

The recording of these practices should be done by taking into account the following aspects :

- Measuring the sustainability of our lifestyles.
- Making up our own sustainability indicator profile and comparingourprogressyearly
- Observance of spirituality, altruism by offering volunteer services, solidarity, Gifting to charity, Development of under-previledged, less fortunate people.
- More should be done to help each person develop and use such indicators to manage their own well-being and sustainability. Such indicators can also contribute substantially to education for sustainable development.

Thus it is thought that every wise and learned person should think deeply towards the commitment for saving the Earth. In reality, the earth can be saved but not the mankind if we keep on continuing with callous consumption of our valuable natural resources.

Dr. Nandini Deshmukh
District Manager, Climate Reality Organization, Mumbai (Maharashtra)

Speakers's Speech

It's my pleasure to give the address on Global warming, Climate Change & its effect on Environment and Global Economy. During our daily activities we consume a lot of energy which adds to rise in global warming. World over energy generation is largely based on Fossil Fuels. Energy equal to the exploding 400,000 Hiroshima type of bomb is generated in to Earth's atmosphere every day. 90 %of this energy is absorbed by Ocean Waters, giving rise to increase in ocean water temperatures. This entire rise in global warming, especially since the start of Industrial revolution, is affecting change in climatic conditions. Extreme climatic conditions like the following are occurring time and again in various parts of the world. Some of them are:

1. Shift in Monsoon Cycle
2. Rise in summer & winter ambient temperatures
3. Rise in frequency of high intensity showers
4. Rise in floods
5. Rise in droughts
6. Rise in untimely hail storms
7. Rise in frequency of forest fires

65 % of Power generation in India in still based on burning of Fossil Fuels. Consider Mumbai City, with population more than 17 million & rising transport sector alone contributes to huge amount of Green House Gases. This leads to rise in daily ambient temperatures. Let us check some of the Environmental Problems faced by Mumbai city,

1. Shrinking Mangroves
2. Air pollution giving rise to toxic air
3. Dying Powai lake
4. Garbage dumping ground fires
5. E-waste poisoning - 96000 tonnes of e-waste generated annually in the City
6. Reduction in forest cover, especially Aarey Colony
7. Rising plastic waste - more than 800 tonnes of plastic waste is generated daily in the city.
8. Highly polluted Mithiriver, due to dumping of all types of waste.

Effect of extreme climatic events on Human Health:

1. **Impact of high temperatures -** High temperatures give rise to diseases like Dengue, Chikengunia, etc., that lead to dehydration / death
2. **Impact of Air pollution -** Daily inhaling of polluted air leads to a allergic illnesses, asthma along with respiratory & cardiovascular illnesses . Similarly inhaling of 2.5 PM and 10 PM particulate matters leads to lung cancer.
3. **Impact of Water Pollution -** Consuming polluted/ unsafe water leads to gastro- intestinal diseases; Polluted water also affects body's nervous & respiratory systems along with liver & kidney.
4. **Mental Health -** Any change in a person's physical health or surrounding environment have direct impact on mental health and it is a cumulative effect.

Economic Impact - Every year billions of dollars are spent to counter the effect of climate change. Let us consider the economic impact on Mumbai City,

1. Loss of Man Days, due to climate related diseases. This results in loss of production affecting economy of the Mumbai city.
2. 40 % of Mumbai City infrastructure is built on reclaimed land. With sea level rising at faster rates, such infrastructure will be at the risk of submerging, due to sea water encroachment. This will have huge cost effect on city's economy.
3. Health cost to mitigate adverse effects of climate change on citizens will keep rising annually.
4. Ingress of sea water into the groundwater aquifers will pollute the groundwater. This will have an impact on water supply to the citizens. Rising population with reduced water supply will have adverse effect on the health of the citizens.

This list is never ending; As young students you must get more involved to learn more about the science of global warming & climate change. Remember it is not only your survival but also the survival of human race.

Col. Dalvi
District Manager, Pune (Maharashtra)
The All India Climate Reality Project

Global Warming - It's Impact on Climate Change and Environment

Dr. Usha Sukumar Iyer *

Abstract - Global warming and climate change have significant impacts on socio-economic, demographic, development and health aspects of population both at micro and macro levels. Global warming reflects in climate change, which include changing weather patterns, rising sea level, and more extreme weather events. The greenhouse gas emissions from human activities are bringing about a climate change. Without action, the world's average surface temperature is projected to rise over the 21st century and is likely to surpass 3 degrees celsius this century, with some areas of the world expected to warm even more **(United Nations, 2015).** The results of the data **a**nalysis on carbon emissions among the countries of the world during the period 1992-2013 **(Population Reference Bureau, 2016)** reveals an accelerated rise in carbon emissions in less developed countries and a decline in it in the more developed countries. The poorest and the most vulnerable people are affected the most. Climatic change is a global issue and countries of the world should unite and take measures to move towards a low-carbon economy. Global warming may be prevented through statutory regulations, reduction in thermal power stations, reduction in the use of paper, grow more trees and share a car and so on. This paper intends to study the nature and significance of the global warming in relation to its impact on climate change and environment.
Key Words - Global warming, Climate Change, Environment.

Introduction - Global warming is characterized by a rise in the average temperature of the earth's surface and oceans due to anthropogenic and natural activities leading to a catastrophic long term climate change. This term was first coined in 1975 by **Wallace (1975)** in his paper titled 'Climate Change: Are we on the brink of a pronounced Global warming?' In 1988, the UNO and the World's attention to this grievous forthcoming global calamity resulted in the establishing of **Intergovernmental Panel on Climate change (IPCC, 2008).**

The thickening of earth's atmosphere due to the presence of increased carbon dioxide and other greenhouse gases is called greenhouse effect. Deforestation and industrial emissions result in greenhouse gases and other pollutants that absorb more heat from the sun. This causes an increase in the intensity of heat in the atmosphere, resulting in global warming.

Climate change refers to a broad range of global phenomena created predominantly by burning fossil fuels, which add heat-trapping gases to earth's atmosphere. These phenomena not only include the increased temperature trends described by global warming, but also encompass changes such as sea level rise; ice mass loss in Greenland, Antarctica, the Arctic and mountain glaciers worldwide; shifts in flower/plant blooming; and extreme weather events **(NASA, 2018).**

The ecological consequences become visible in global warming, loss of biodiversity, deforestation, desertification and decreasing natural resources **(Chasek, Downie, and Brown 2006)**. These ecological consequences impact on development issues, e.g., food and water supply, diseases and migration. As a consequence, poverty will increase and there would be conflicts over natural resources. Without taking environmental issues into account, development will be a dead-end street. Sustainable development should therefore be a serious issue in all kinds of policy fields affecting development such as trade policy, foreign policy or economic policy **(EADi, 2018).**

To address climate change, countries adopted the **Paris Agreement** at the COP21 in Paris on 12th December 2015. The Agreement entered into force shortly thereafter, on 4th November, 2016. In the agreement, all countries agreed to work to limit global temperature rise to well below 2 degrees celsius, and given the grave risks, to strive for 1.5 degrees celsius **(United Nations, 2015).**

There is a need to address the implications of climate change by promoting climate-friendly trade and production strategies. The rationale behind this paper is to highlight the grave issue of global warming and reveal its effects on climate and environment.

Objectives -

1. To understand the nature and level of global warming

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2. To explain the impact of global warming on climate and environment

Data and Method - This study uses the data from the World Population Data Sheet 2016 by Population Reference Bureau. The indicator carbon emissions (tons) for the years 1992 and 2013 were used for the analysis in this study. This study also reviews the research findings from various available reports and literatures of International publications.

I. Global Warming: Levels and Change - The percentage of carbon emissions in the world has increased from 6110 million metric tons in 1992 to 9776 million metric tons in 2013, a change of 60% in 21 years of time. It is striking to note that while carbon emissions have reduced in more developed countries by 4.7%, it has increased by 161.8% in less developed countries during the same period **(Table 1, Fig 1).**

As far as the regions are concerned, carbon emissions have increased in all the continents except Europe. There is a significant increase in carbon emissions in Asia (157.6 %) followed by Africa (83.1%), Oceania (43.2%), and America (17.8 %). But it has decreased in Europe from 1884 million metric tons to 1560 **(-17.2** %) **(Table 1, Fig 1).**

As far as the **top 10 most populous countries** of the world, the carbon emissions show that during 1992-2013 has been spelled more in Bangladesh (291.7%) and China (280.2 %) followed by India (191.1%), Indonesia (136.8%), Brazil (128.2 %), Pakistan (110.1%). The statistics reveal that the United States, Nigeria and Mexico experienced an increase in carbon emissions by 5.6 %, 49.1% and 48.2% respectively, though not very significant. It is significant to note the carbon emissions in Russia (-13.9 %) had decreased in the same period **(Table 2, Fig 2).**

The analysis reveals that carbon emissions show a significant increase in less developed countries as compared to more developed countries during 1992 to 2013. This calls for an awakening among the countries of the world about the danger of global warming and climate change.

In recent years, China has taken the lead in global-warming pollution, producing about 28% of all CO2 emissions. The United States comes in second. Despite making up just 4% of the world's population, America produces a whopping 16 percent of all global CO2 emissions - as much as the European Union and India (third and fourth place) combined. America is still number one, by far, in cumulative emissions over the past 150 years. Our responsibility matters to other countries, and it should matter to us, too **(Amanda, 2016).**

II. Global Warming and its impact on Climate and Environment - The increased volumes of carbon dioxide and other greenhouse gases released by the burning of fossil fuels, land clearing, agriculture, and other human activities, are the primary sources of the global warming over the past 50 years. These are reshaping our planet effecting a rapid climate and environmental change. Scientists from the **Intergovernmental Panel on Climate Change** carrying out global warming research have recently predicted that average global temperatures could increase between 1.4 and 5.8°C by the year 2100**.** Climate change is accelerating due to human activities. Global temperature averages are rising, seas are warming, rising and becoming more acidic, and extreme weather events such as droughts, wildfires, floods and powerful storms are now becoming more common. The planet is warming, from North Pole to South Pole. Since 1906, the global average surface temperature has increased between 1.1 and 1.6 degrees Fahrenheit (0.6 to 0.9 degrees celsius) - even more in sensitive polar regions **(Live Science).**

Chart 1

1. Rising Temperature - Global warming affects weather by making the climate hot or cold, or making it switch back and forth. Ice is melting worldwide, especially at the earth's poles. This includes mountain glaciers, ice sheets covering West Antarctica and Greenland and Arctic sea ice. Precipitation (rain and snowfall) has increased across the globe.

Many species have been impacted by rising temperatures. For example, researcher **Bill Fraser** has tracked the decline of the Adelie penguins on Antarctica, where their numbers have fallen from 32,000 breeding pairs to 11,000 in 30 years. If Global warming continues, hurricanes, earthquakes and storms will become stronger. Floods and droughts will become more common. Rainfall in Ethiopia could decline by 10 percent over the next 50 years **(National Geographic Society 1996-2005).**

2. Rise in sea level - A significant effect of Global warming on the environment is that it affects sea level. Global warming raises the overall temperature and cause glaciers and ice caps to melt, which makes the water expand. When this happens, sea levels tend to rise more rapidly than normal. According to the Third Assessment Report by the **Intergovernmental Panel on Climate Change**, the sea level is expected to rise as much as 88 centimeters in the next century.

Changes resulting from global warming include rising sea levels due to the melting of the polar ice caps, as well as an increase in occurrence and severity of storms and other severe weather events. The sea level has been rising more quickly over the last century. Sea levels are expected to rise between 7 and 23 inches (18 and 59 centimeters) by the end of the century, and continued melting at the poles could add between 4 and 8 inches (10 to 20 centimeters) **(National Geographic Society 1996-2005).**

3. Oceans acidification - Ocean acidification is also affected by global warming. Due to the rise in sea levels and precipitation, the carbon dioxide is mixed more with sea water. Less fresh water will be available and this is a major concern for ocean life, especially coral.

If the Quelccaya ice cap in Peru continues to melt at its current rate, it will be gone by 2100, leaving thousands of people who rely on it for drinking water and electricity without a source of either **(www.nationalgeographic.com).**

4. Wildlife and Migration - A research study published in the journal Nature Climate Change, estimates that 47 per cent of mammals and 23 per cent of birds on the International Union for Conservation of Nature's **(IUCN)** Red List of Threatened Species have been negatively affected by climate change **(Down to Earth, 2017).**

A team of researchers from Australia, Italy and Britain went through 130 studies (published between 1990 and 2015) that documented species that were affected or not by changes in climate. Of the 873 mammal species studied, 414 were affected by climate change. Elephants, primates and marsupials were among the most vulnerable. Out of 1,272 bird species looked at, 298 birds are found experiencing negative effects. Birds living at high altitudes are among the hardest hit **(Down to Earth, 2017).** The analysis suggests that climate change can diminish the ability of mammals to exploit natural resources, especially those species that are less able to adapt to changing ecological conditions. Climate change can disrupt migration patterns of both birds and mammals and shrink vital habitat. Slow reproductive rates also make primates and elephants vulnerable to global warming.

5. **Agriculture production -** Climate change has a direct impact on food production across the globe. Increase in the average seasonal temperature may reduce the duration of many crops and yield. World agriculture faces a serious decline due to global warming. Overall, agricultural productivity for the entire world is projected to decline between 3 and 16 % by 2080. Developing countries, many of which have an average temperature that are already near or above crop tolerance levels, are predicted to suffer an average 10 to 25% decline in agricultural productivity in 2080s. Rich countries, which have typically lower average temperatures, will experience a much milder or even positive average effect, ranging from 8% increase in productivity to 6% decline. Individual developing countries face even larger declines. India, for example, could see a drop of 30 to 40% **(Mahato, 2014).** The burden of climate change is likely to fall disproportionately on the poorer countries of the world.

6. Livestock - The most significant direct impact of climate change on livestock production comes from the heat stress that results in a significant financial burden to livestock producers through decrease in milk component and milk production, meat production, reproductive efficiency and animal health. Variations in temperature and rainfall are the most significant climatic variables affecting livestock disease outbreaks. Warmer and wetter weather will increase the risk and occurrence of animal diseases causing heavy economic losses.

7. Human Health - Climate change is a health issue affecting billions of people, not just an environmental issue about polar bears and deforestation **(Costello, 2009).** Human beings are exposed to climate change through changing weather patterns. Climate change was estimated to have been responsible for 3% of diarrhoea, 3% of malaria, and 3.8% of dengue fever deaths worldwide in 2004. Total attributable mortality was about 0.2% of deaths in 2004; of these, 85% were child deaths **(WHO, 2009).** With high confidence, authors of the synthesis report **(Pachauri and Reisinger, 2007)** projected that climate change would bring some benefits in temperate areas, such as fewer deaths from cold exposure, and some mixed effects such as changes in range and transmission potential of malaria in Africa. Benefits were projected to be outweighed by negative health effects of rising temperatures, especially in developing countries.

Both global warming and climate change can also produce different impacts depending on the local geography as well as the local inhabitants (plants, animals, etc.) Many of these changes will cause unexpected and dangerous effects on life around the world **(Bernstein, Pachauri, and Andy, 2008).**

Global warming is causing climate change and the world is becoming warmer and warmer. There is also prediction of regional climate changes along the ecosystem. The coastal cities and ports may be submerged under sea-water. Many islands may vanish from the earth surface as well as from the world map.

Problems of water availability are likely to be more serious and perhaps more expensive to solve. In future, warmer world will face water crisis in some parts while in other regions it will be wetter than it is now. There is uncertainty regarding regional forecasts of future precipitation as warming of globe makes it difficult to predict. Also, pattern of agricultural changes, or effects on ecosystems in general are fairly unpredictable **(Kakkar, 2015).**

Economic development was an important component of possible adaptation to climate change **(Confalonieri et al. 2007).** Future vulnerability to climate change will depend not only on the extent of social and economic change, but also on how the benefits and costs of change are distributed in the society.

III. Prevention of Global Warming - The problem of Global Warming can be controlled by minimizing the emission of greenhouse gases into the environment. The preventive steps that would help save the earth from the harmful effects of Global Warming are:

- Laws that govern pollution and greenhouse gases should be strictly followed.
- Reduction in thermal power generating stations and as well as our dependence on it for electricity would help towards reducing the quantity of carbon dioxide in the environment.
- Buying recycled paper products is a great way to prevent global warming. The use of paper can be saved by keeping documents in electronic format and by not printing emails.
- Planting trees will help to reduce the problem of global warming as they absorb carbon dioxide and release oxygen.

- Sharing our car while going to office will save money and will emit less greenhouse gases **(Kakkar, 2015).** Driving less and taking a bike or walking can help to prevent global warming.
- Cutting down on garbage by buying fewer packaged materials can also help to prevent global warming.

Conclusions -

1. The study reveals that global warming is a world-wide phenomenon but the less and the least developed countries are affected the most.
2. The impact of global warming on climate and environment is a real issue and will lead to dangerous and disastrous effects in future if suitable action is not taken.
3. Policies and measures to protect the climate system should be integrated with national development programs, taking into account that addressing climate change is essential for economic development.

It is widely acknowledged that economies cannot continue to grow with the same consumption and production patterns. Between 1950 and 2010, for example, while the global population increased almost threefold, the use of natural resources, including biomass, fossil fuels, ores, minerals and water, increased sevenfold. This significant increase in resource use has also led to increasing waste and emissions and growing environmental impacts **(UNDP & UNRISD 2017).**

Climate change should be addressed through eco-social policies accompanied by a normative and change in policy considering ecological and social objectives in development strategies. Policymakers should aim at providing an enabling environment for social innovation that brings about a behavioural change to protect the environment. According to **Watson (Phionah 2017),** "the big thing is not making climate change a future threat, but prioritizing climate-smart actions now".

Table 1

Carbon Emissions (million metric tons) and their Change, World and Regions, 1992-2013

Area	Carbon emissions (million metric tons)		% Change (1992-2013)
	1992	2013	
WORLD	6110	9776	60.0
More Developed	3730	3556	-4.7
Less Developed	2169	5678	161.8
Major regions			
Africa	189	346	83.1
America	1743	2054	17.8
Asia	2002	5158	157.6
Europe	1884	1560	-17.2
Oceania	81	116	43.2

Source - Population Reference Bureau, 2016 World Population Data Sheet

Figure 1

Table 2 - Carbon emissions (million metric tons), Percentage Change in top 10 most Populous countries, 1992-2013

Top 10 Most Populous Countries	Carbon emissions (million metric tons)		% Change (1992-2013)
	1992	2013	
1. China	735.2	2795.1	280.2
2. India	190.6	554.9	191.1
3. United States	1339.3	1414.3	5.6
4. Indonesia	55.2	130.7	136.8
5. Brazil	60.2	137.4	128.2
6. Pakistan	19.9	41.8	110.1
7. Nigeria	17.5	26.1	49.1
8. Bangladesh	4.8	18.8	291.7
9. Russia	566.9	487.9	-13.9
10. Mexico	89.6	133.2	48.2

Source - Population Reference Bureau, 2016 World Population Data Sheet (Figure 2)

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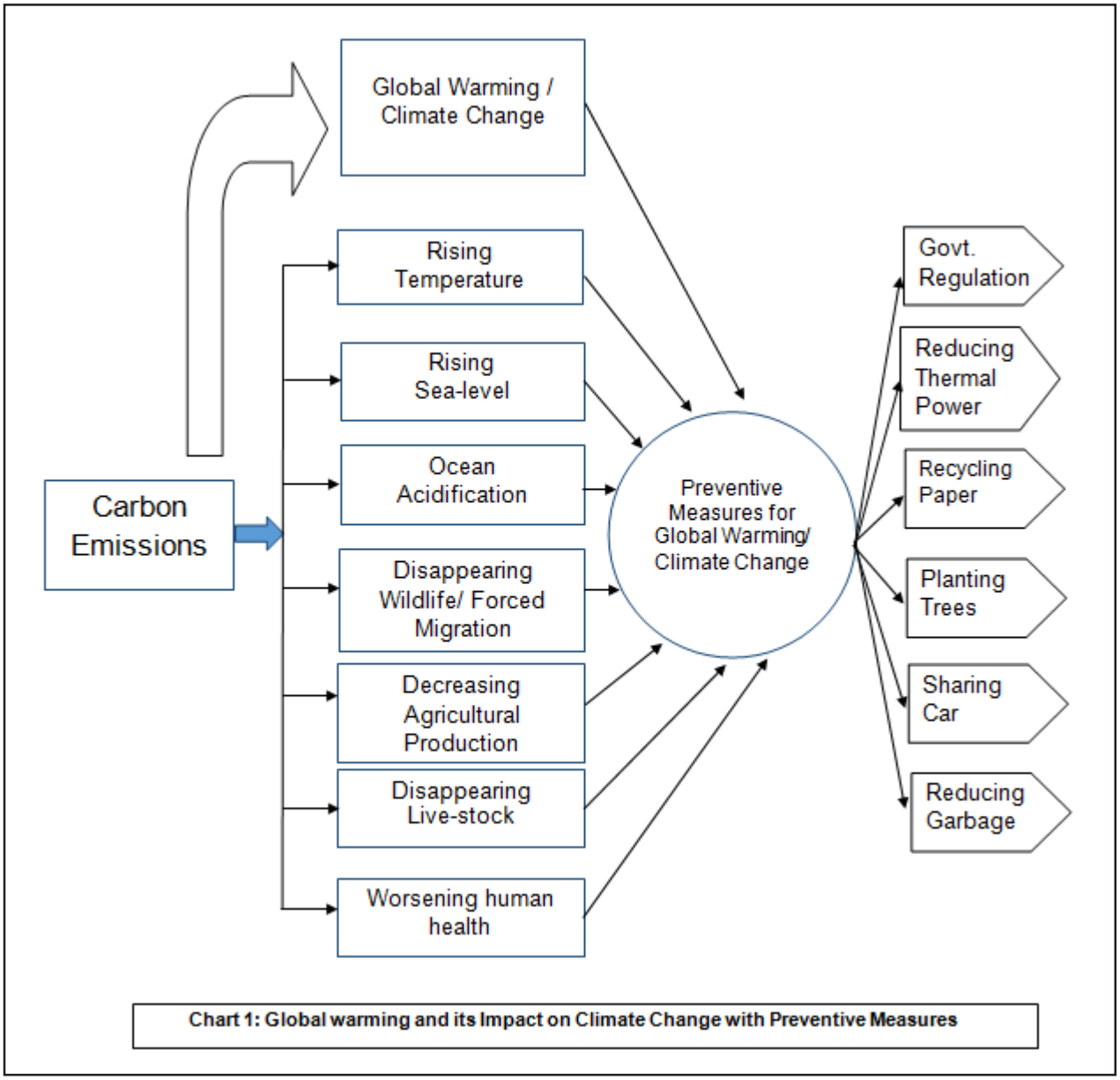

Chart 1: Global warming and its Impact on Climate Change with Preventive Measures

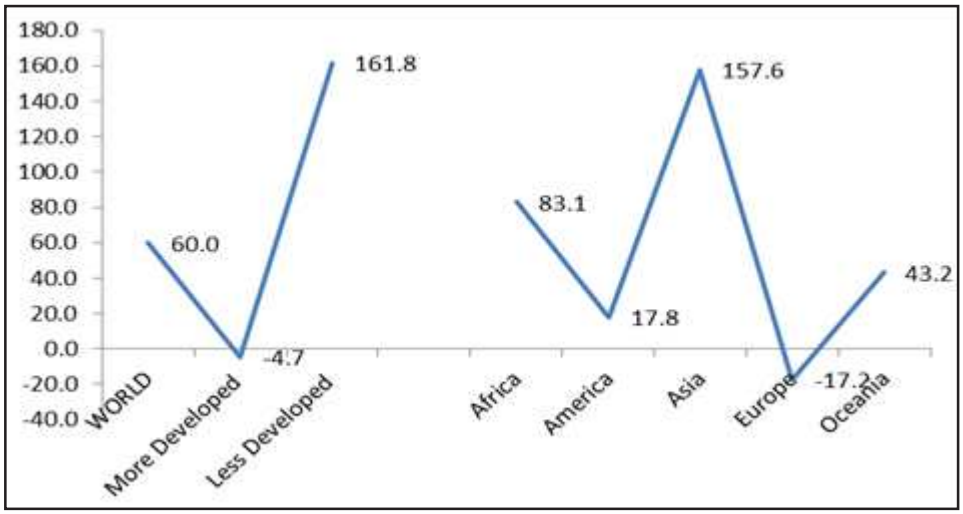

Figure 1- Percentage change in carbon emissions in the World and Regions 1992-2013
Source - Population Reference Bureau, 2016 World Population Data Sheet

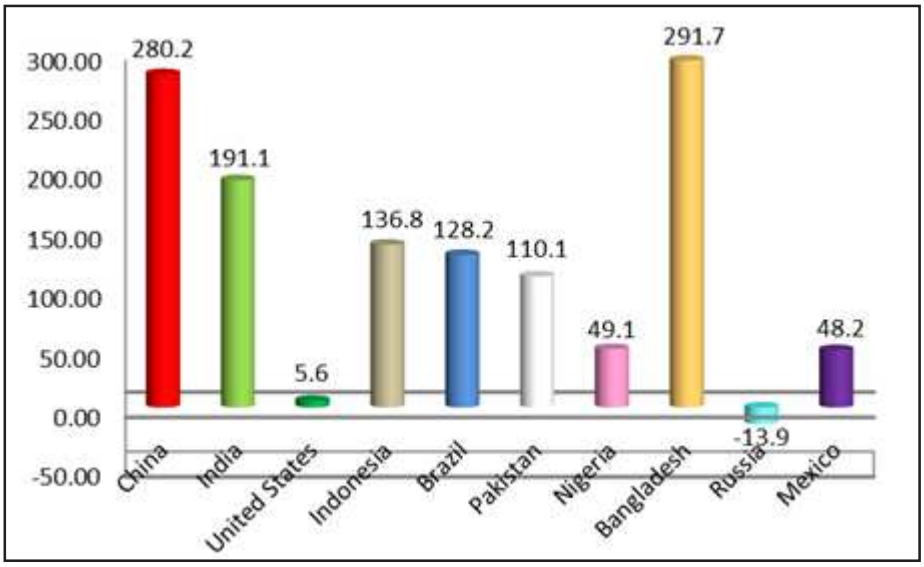

Figure 2 - Percentage change in carbon emissions in top 10 most Populous countries 1992-2013
Source - Population Reference Bureau, 2016 World Population Data Sheet

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Changes in Growth Behavior of Cyanobacterium Anabaena Doliolum Exposed To UV-B and Endosulfan

Abhishek Chris* **Kayio Kayina****

Abstract - UV-B (30 and 60 min) and endosulfan (5 and 10 ppm) induced changes in chlorophyll, carotenoids, phycocyanin, proteins average filament length (AFL) and heterocyst frequency (HF) in *Anabaena doliolum* were studied. UV-B and endosulfan both declined protein individually and in combination. Like protein these stresses declined the photosynthetic pigments especially phycocyanin and the decrease was severe when they were given in combination. With rising concentrations, average filament length (AFL) and heterocyst (HF) were less in number.
Key Words - Growth, UV-B, endosulfan, *Anabaena doliolum.*

Introduction - Cyanobacteria also known as 'blue green algae' are capable of fixing atmospheric nitrogen either as free living organisms or in symbiosis with many other species **(De, 1939)**. They use the enzyme nitrogenase to reduce atmospheric nitrogen into ammonia ions (NH_4^+) which they make available for aquatic eukaryotic phytoplanktons as well higher plants **(Chris, 2013)**. *Anabaena doliolum* and *Nostoc muscorum* are filamentous cyanobacteria abundantly found as planktons in paddy fields and are known for their nitrogen fixing abilities **(Rai and Abraham, 1993; Chris and Kumar, 2013)**. Chlorinated pesticides viz. DDT, heptachlor, edosulfan etc. have been used extensively for protection of crops like corn, mango, paddy and others to prevent vector borne diseases.

On the other hand, these pesticides persist in the environment for very long periods and therefore impart toxicity to non-target organisms including cyanobacteria as well as its symbiotic association *Azolla* **(Chris, 2016)**. Cyanobacteria as a group are thought to have survived a wide spectrum of global environmental stresses such as heat, cold, drought, salinity, UV-B etc.**(Taneau de Marsac and Houmard, 1993)**. Recent findings indicate that UV-B radiation at Earth surface is continuously increasing due to ozone layer depletion because of pollutants like chlorofluoro carbons, chlorocarbons, organobromides etc. **(Chris, 2008)**.

UV-B is known to affect processes such as growth, survival, pigmentation, motility as well as enzymes of nitrogen metabolism and carbon fixation, DNA and phtcobiliproteins **(Hader and Hader 1990)** important microorganisms is yet available. Hence, this study on 'Changes in growth behavior of cyanobacterium *Anabaena doliolum* exposed to UV-B and endosulfan'.

Materials and Methods -

Organism, growth conditions -The filamentous heterocystous cyanobacterium *Anabaena doliolum* was isolated from rice fields near Allahabad and was raised to axenic culture. The culture was axenically grown in nitrogen free BG-11 medium (Rippka *et al*. 1979) at 27±2 ^{0}C pH 7.2 under 75 µmol $m^{-2}s^{-1}$ photon flux density (PFD) with a photoperiod of 14:10 h. The exponentially grown cyanobacterial cells were used throughout the experiment.

UV-B and endosulfan treatment - The culture suspension occupying a depth of 0.25 cm, in sterilized 7.5 cm Petri dishes were exposed to artificial UV-B (0.2 W m^{-2}) (TL40WY12 Phillips, Holland) with its main output at 312 nm along with cool white fluorescent light of 20 µ mol $m^{-2}s^{-1}$ PAR intensity. Radiation dose of 30 and 60 min exposure at surface of culture were 0.18 and 0.72 KJ m^{-1}, respectively. Stock solution of endosulfan was prepared in 70 percent ethanol and the solution was further sterilized by passing through Millipore membrane filter (0.22 µm). From the stock solution, various required concentrations of pesticide were prepared in BG-11 medium.

Growth and photosynthetic pigment estimation - Growth was measured by estimating the protein content of cyanobacterium after 4 days of treatment (Lowry *et al*.1951). Chlorophyll and carotenoid contents were extracted in 80 percent acetone and measured according to method of Myres and Kratz (1955). Phycocyanin was extracted in potassium phosphate buffer (pH7.0) after repeating freezing and thawing and absorbance was measured at 620 nm according to the method of Blumwald and Tel-Or (1982).

Heterocyst frequency and Average filament length - For the estimation of heterocyst frequency, cyanobacterial filaments were examined under a light microscope. The

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vegetative cells and heterocysts of the cyanobacteria were counted and the percentage of the heterocysts in total cyanobacterial population was determined. Average filament length was calculated as total number of vegetative cells in individual filament divided by number of filaments observed.

Statistical Analysis - The different parameters were statistically analyzed using Student's 't' test.

Result and Discussion - Table 1 shows a general inhibition of growth due to the stresses used in the current study. Approximately 86 and 74 percent protein content was noticed after 30 and 60 min of UV-B exposure, respectively. However in the case of endosulfan, the protein content was 83 and 67 percent following 5 and 10 ppm treatment. The intensified decrease in protein content was noticed following the combined treatment of UV-B and endosulfan. Both the doses of pesticide along with 30 min UV-B exposure decreased the protein content by 54 and 36 percent. Similarly, a combination of UV-B 60 min and both the doses of pesticide brought a decrease of 59 and 78 percent in protein content.

The results of the present study show that *Anabaena doliolum* is highly sensitive to UV-B and pesticides. The reduction in the protein content might have been due to denaturation of proteins following absorption of two stresses by aromatic amino acids present in the proteins. UV-B irradiation is known to cause a number of modification in proteins such as photodegradation, an increased aqueous solubility of the membrane proteins and the fragmentation of the peptide chains, leading to the inactivation and disruption of their structural subunits **(Hader, 2001; Chris 2016)**.

All photosynthetic pigments chlorophyll, carotenoids and phycocyanin were reduced by UV-B 30 and 60 min exposure as well as 5 and 10 ppm exposure of endosulfan, either alone or in combinations (Table 1). 5 and 10 ppm doses of pesticide to test organism declined Chl from 100 percent to 82 and 54 percent Car from 100 percent to 85 percent and 73 percent and phycocyanin to 82 and 53 percent.

Likewise, 30 and 60 min UV-B doses decreased Chl by 15 and 36 percent, Car 8 and 36 percent and phycocyanin by 20 and 43 percent. Further decrease in contents of these pigments was noticed with increasing exposure time of UV-B. The inhibitory effect of UV-B on pigments became more pronounced when both applied doses of UV-B were combined separately with endosulfan 5 ppm and endosulfan 10 ppm.

The combinations generated synergistic reduction in pigment content. Phycocyanin was severely affected which was followed by chlorophyll and carotenoids (Table1). It could be due to inhibition of Chl biosynthesis by inhibiting d- aminolevulinic acid dehydrogenase and photochlorophyllide reductase activity and breakdown of pigments of their precursors as reported earlier **(Chris *et al.* 2008; Chris, 2016; Kumar, 2012)**.

In our observation, the severely affected pigment was phycocyanin. The fact that phycocyanin is primary target of UV-B is due to its proteinaceous nature and its localization on the outer surface of the thylakoid membrane **(Chris *et al.* 2008)**. Both average filament length (AFL) and heterocyst frequency (HF) showed significant reduction in all doses.

Exposure of cyanobacterium to UV-B_{30} and UV-B_{60} reduced AFL by 17 and 28 percent, and HF 40 and 58 percent respectively. Endosulfan 5 and 10 ppm declined AFL by 15 and 30 percent and HF by 33 and 60 percent respectively.

On the other hand, both the stresses together caused a significant decrease in both the parameters. Change in HF is directly related to N_2 fixation; this could be attributed to the interference of endosulfan with heterocyst's envelope and maturation rather than their differentiation process and affects their efficiency in N_2 fixation. Orus *et al.* (1990) reported that the destabilization of the heterocyst envelope is the first target of insecticidal action causing inhibition of nitrogen fixation. Reduction was noticed in AFL also; such changes may be associated with changes in cell division and cell elongation or due conversion of indole acetic acid into various photooxidative products **(Chris, 2013)**.

Conclusion : In conclusion it was found that cyanobacterium *Anabaena doliolum* is at severe risk when exposed to UV-B radiation and endosulfan. The combination of these two stresses may cause serious damage to cyanobacteria which is an excellent biofertilizer in the rice agroecosystem. Excessive use of pesticide and enhanced UV-B radiation has detrimental effects on the growth of these beneficial microorganisms, soil fertility and ultimately on the rice productivity.

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Glacial Ice Melting- Causes, Consequences and Remedial Measures

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Abstract - Glacial ice means large deposits of ice in the southern and northern polar regions of the earth. These deposits play an important role in maintaining the ecological balance of the earth as a whole. Any significant change in the quantity and area of these glacial ice deposits will negatively impact not only human life but also flora and fauna of different regions of the earth. This basic problem of glacial ice melting and other severe problems arising therefrom are not restricted to any country or region of the earth but their impact is felt all over the world. Melting of glaciers is both cause as well effect.

Causes of global ice melting, *inter alia*, include- rise in atmospheric temperature, depletion of ozone layer, increase in greenhouse gases, accumulation of dust on the glacial ice, global warming, volcanic eruptions etc.
Noteworthy effects of glacial ice melting, *inter alia*, include- increase in sea level, shifting of tectonic plates, flashfloods, formation of new rivers, loss of life and property on the riverbanks, increase in the global temperature, loss of glacial habitat etc.

In view of the severity of the problems arising out of glacial ice melting, there is a need to make concerted efforts for completely solving this problem, if not, at least reducing its severity. There is a need on the part of all the countries of the world to genuinely put in their best efforts to solve this problem.
Key Words - Glacial ice melting, ecological balance, greenhouse gases, global warming, volcanic eruptions, depletion of ozone layer.

Introduction - Glaciers- A Conceptual Exposition - A glacier is a large body of ice spread over a wide area. 99 percent of the world's ice is contained within vast ice sheets in the northern and southern Polar Regions. Each has an area about 14 million square kilometres. The process of glacial ice melting is due to increase in the atmospheric temperature and other reasons. This process of glacial ice melting is caused by a number of factors and many of them are man-made. This process will ultimately leads to catastrophic consequences for human life and also flora and fauna of different regions of the Earth.

The problems arising out of glacial ice-melting are not limited to any specific region but is spread over entire earth. At present, each and every country is facing problems arising out of melting of glaciers. Certain problems are so severe and disastrous that we cannot simply imagine the catastrophe caused by melting of glaciers. One of them is that low-lying countries like Maldives, Bangladesh etc. are facing the problem of inundation.

This paper makes an attempt to analyse the causes and consequences of melting of glaciers on the ecosystem of the world as whole. Some remedial measures have been offered to lessen the consequences of this problem of global magnitude.

Objectives of the Study - Following are the objectives of the study.

1. To analyse different causes of the problem of glacial ice melting.
2. To analyse different consequences of this problem on human life and also on the flora and fauna of the world.
3. To highlight the role of polar glaciers in the world ecology.
4. To offer some remedial measures for solving the problem of glacial ice melting.

Research Methodology - This paper is conceptual in nature and is based on secondary data. The required statistical and non-statistical data have been sourced online.

Importance of Polar Glaciers in the World Ecology - Glaciers play an important role in the world ecological system. They are not just vast expanse of ice caps but ultimately play an important role in establishing and maintaining a link between biotic and abiotic systems in the ecology. They are considered as air conditioners in the world ecosystem. The following points bring out the role and importance of glaciers.

1. Glaciers help to keep the earth cool.
2. They contain most of the available drinking water on the earth.
3. They provide shelter to many polar animals, birds etc.

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4. They play an important role in maintaining ecological balance.

Causes of Glacial Ice Melting - There are a number of reasons behind the melting of glacial ice plates. Some of these are causes as well as effects. For example, global warming is both a cause as well as an effect of glacial melting. Following are some of the reasons for melting of glacial ice.

1. **Rise in Atmospheric Temperature -** The rise in atmospheric temperature is the first and foremost reason behind the melting of glaciers. Glaciers play an important role in maintaining the atmospheric temperature at a required level. When different human and industrial activities cause rise in the atmosphere temperature, the vast ice sheets at the polar regions start melting. These ice sheets can remain intact in their original form only at specific atmospheric temperature. If human activities (and also natural calamities like volcanic eruptions) cause rise in the atmospheric temperature, the process of melting the ice will set in motion. The reduction in the volume of polar ice caps will once again lead to a rise in global warming. Thus, rise in atmospheric temperature and melting of glaciers are both cyclic in nature.
2. **Depletion of Ozone Layer -** Though there is no direct relationship between glacial ice melting and depletion of ozone layer, excessive heat combined with chemical emissions damages the sensitive ozone layer in the atmosphere. This layer acts as a sieve in preventing the harmful ultraviolet rays from reaching the earth. The adverse effects of depleted ozone layer include eye damage, damage to immune system, ageing of skin, difficulty in breathing, adverse effects on marine ecosystem etc. In the absence of or thin presence of the ozone in the atmosphere, harmful UV rays directly reach the earth. This can alter the time of flowering of some plants and plant growth. Excess presence of ozone in the lower atmosphere causes global warming and this ultimately leads to melting of glacial ice.
3. **Increase in Greenhouse Gases -** A greenhouse gas is defined as a gas that contributes to the greenhouse effect by absorbing infrared radiation. These gases include carbon-di-oxide, chlorofluorocarbons (CFCs) etc. These gases will lead to melting of ice deposits in the glaciers. If the particles of these gases together with dust particles settle on the ice sheets, the process of melting of ice will start. Thus, increase in greenhouse gases leads to global temperature and melting of glacial ice.
4. **Accumulation of Dust on the Glacial Ice -** Different types of dust particles are more prevalent in the non-glacial regions of the earth as compared to glacial regions. Due to change in the direction of the winds, such particles are carried towards polar regions. This process takes place particularly during summer season when atmosphere temperature alarmingly increases non-polar regions. When these particles settle on the surface of the glacial ice, they start melting. Polar ice is extremely sensitive to foreign material particularly to different types of dust particles. One more reason for dust accumulation on the polar ice is volcanic eruptions. When volcanoes erupt, the volcanic dust particles (sometimes highly toxic in nature) are carried to the polar regions.
5. **Volcanic Eruptions -** According to one estimate, there are about 1,500 active volcanoes in the world. Of these 500 have erupted in historical times. Of these active volcanoes, about 50 volcanoes erupted in the year 2017.These volcanoes spew highly toxic particles, lava, steam, ash, etc. into the atmosphere. As the heat generated by these is unimaginably higher, it naturally leads to an increase in the atmospheric temperature. Moreover, as has been stated earlier, the dust particles spewed by these volcanoes get pushed towards polar regions by wind force. Thus, the heat and the toxic and other dust particles generated by these volcanoes become the reasons behind melting of glaciers.
6. **Deforestation -** Deforestation is another reason for the melting of glaciers. As is well known, trees absorb carbon dioxide and give out oxygen. As we go on cutting trees, the CO_2 in the atmosphere goes on increasing. As trees absorb the extra carbon in the air it means sun rays can just bounce off of the earth and not get trapped.
7. **Excessive Use of Fossil Fuels -** Fossil fuels are usually carbon generating in nature. Excessive uses of fossil fuels spew excess carbon dioxide in to the atmosphere. Plants cannot absorb such excess CO_2. Excess presence of CO_2, directly or indirectly becomes a contributory factor in melting of glaciers.

Consequences of Melting of glaciers - Melting of glaciers poses serious ecological problems. Such problems are not any region-specific, but impact the entire earth. Following are some of the causes of melting of glaciers.

1. **Freshwater Shortage -** Just over 2 percent of the total water amount on the earth is fresh water and that is fit for human use. Of this, 70 percent is in the form of glacial ice. In many parts of the world, this is the only source of water for human use. Ever-increasing population and rapidly decreasing glacial mass has led to shortage of freshwater. People belonging to the surrounding areas of the Himalayan regions are facing this problem.
2. **Rise in Sea Levels -** Water from the melting glaciers flows to the areas of lower altitudes and finally in to the sea. Sea levels are rising continuously at a rate of approximately 1 to 2 mm per year. Melting of glaciers is one of the dominant reasons for the same. The faster the glaciers melt, the more will be the increase in the sea levels. This will lead to disastrous consequences. Coastal regions of low lying countries face the problem of inundation and hence will have to be relocated to

safer places. Low lying countries like Maldives, Bangladesh are facing this problem. Other problems arising out of rising sea levels include flooding, soil erosion, and contamination of underground water with salt water.

3. **Flash floods -** As a result of glacial ice melting, water input to the adjoining rivers will increase. This process will cause flash floods all along the rivers. As a result of such flash floods, the areas adjoining the riverbanks will be inundated causing immense loss of life and property. This may also lead to formation of new lakes. Water contained in such lakes would be voluminous; bursting of such lakes may cause catastrophic consequences all around.
4. **Increase in the Global Temperature:** As indicated earlier, glaciers play an important role in maintaining atmospheric temperature at a moderate level. Because of this reason they are rightly termed as global air conditioners. They absorb excessive atmospheric temperature and play an important role in arresting global warming. But if they are melted, the atmospheric temperature will naturally rise which will further lead to multiple problems.
5. **Loss of glacial Fauna -** There are certain birds, animals etc. which are accustomed to live in extremely cold conditions (usually in subzero temperature conditions). These birds and animals include polar bear, arctic fox, reindeer, arctic hare, brown bear etc. As a result of melting of glacial ice, the quantity of ice either disappears entirely or considerably reduced. Under such circumstances such fauna face the problem of survival and sometimes they will be extinct.
6. **Destruction of Coral Reefs -** Corals require sunlight for photosynthesis not only for growing but also for surviving. As a result of increase in the sea water and other reasons, corals will not get required sunlight. This, in turn, may affect their quality and sometimes it may kill them. Fish that depend upon the corals (as their food) may experience the problem of food shortage. This ultimately will have a negative effect on the people who fish for survival in these areas. Thus, the rise in sea levels will seriously affect the entire aquatic food chain.
7. **Reduction in Agricultural Output -** Those areas which depend upon rain water for agricultural activities will remain unaffected as a result of melting of glaciers. Areas affected will be those which depend upon water emanating from glaciers. During dry seasons, there will be acute shortage of fresh water from glaciers and hence the agricultural land remains dry. Resultantly, agricultural output will go down leading to shortage of food grains.
8. **Shortage of (Hydro) Electricity -** There are certain places in the world which depend upon the water flowing from the melting glaciers for production of electricity. If the flow of water from these glaciers stops or reduces, the production of electricity will be severely affected. Under such circumstances, such countries will be forced to adopt alternative energy sources for meeting their energy needs.
9. **A Global Problem -** Melting of glaciers and multiple problems arising therefrom are not related to any country or region as such. They are global in nature. Flora and fauna of every country are severely hit by this problem. The severity of the problem may vary according to geographical and climatic conditions. Each and every continent on the Earth is experiencing the effects of rapidly melting glaciers.

The causes and consequences mentioned above are indicative and not exhaustive.

Suggestions for Preventing Melting of Glaciers - Following suggestive measures can be offered for preventing the melting of glaciers.

1. Afforestation, up gradation of diesel filters in cars and replacement of biomass burning stoves by solar power or natural gas in terms of technological advancement etc. should be encouraged on a wider scale.
2. Become more informed about the harmful consequences of melting of glaciers. By doing so everyone can take preventive and curative measures for reducing the impact of glacial melting.
3. An effective global climate policy should be formulated and implemented. This can be done when all the countries come together and make concerted and organised efforts for reducing negative effects on the ecology.
4. Plant more trees to prevent CO_2 emissions and increasing the atmospheric oxygen level.
5. Use more renewable energy sources than using fossil fuels.

Conclusion - If glaciers melt because of natural reasons, it may not pose any threat to the ecology. But if they melt (in excessive doses) due to man's encroachment into nature, it will definitely lead to dangerous consequences. Glaciers are inseparable parts of our ecosystem. Any drastic change in the quantity and the area of these glaciers is going to affect the human life as well as other biotic and abiotic elements in the ecosystem. If concerted and organised efforts are made on the global scale for preventing or at least reducing the melting of glaciers, they are sure to sustain human and other organisms for generations to come.

As far as glaciers are concerned, *pristine ambience* is the need of the hour. ***If we neglect environmental considerations in the name of achieving economic development, it is highly dangerous and unjustifiable.*** We have our responsibilities towards the future generations. If we disregard environmental considerations, our next generation will inherit such an ecosystem which would be highly unfit to live in.

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Climate Change, Air-Conditioning Business and Human Health

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Abstract - Healthy physical environment is the pre-requisite for sustaining and improving human development. Environment includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property. According to the Article 51 A (g) of the Indian constitution, it shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures. The global warming and climate change are caused directly by many acts of human beings and indirectly through impacts of such acts. Animals, livestock like sheep and cattle, produce methane, a greenhouse gas. When livestock grazed at a large scale, the amount of methane produced is a big contributor to global warming. Air-pollution has significant impact in environmental degradation. Air conditioning is the process of removing heat and moisture from the interior of an occupied space, to improve the comfort of occupants. Having advantageous perception on health benefits of air-conditioning, some research studies prove the adverse impact of using air-conditioning on human health. Pollutants released by microorganisms, termed bioaerosols, may be spread in the indoor environment through the air-conditioning system. Increased use of air-conditioning and expansion of its business boosted through climate change cause air pollution and subsequently human health. Preventing deforestation as well as planting trees through afforestation are important actions in the fight against global warming. The global warming and climate change have an adverse impact on human health. Keeping these in view, this paper attempts to understand the concept climate change nature of air-conditioning business and their impact on human health.
Keywords - Air-conditioning, Climate change, Human health.

Introduction - Better human living is associated with the healthy environment. Environment is everything that is around, which can be living or non-living things. Environment includes physical, chemical and other natural forces. Living things live in their environment. They constantly interact with it and change in response to conditions in their environment. Environment, especially, the physical environment occupies a prominent importance in sustainable development in terms of health through clean air, nutritious food, sufficient and quality needs, well-being of all the environmental factors, regulating air and climate, source of natural beauty. Safeguarding environment is considered more important in the twin vital processes viz. population stabilisation and sustainable development. There have been many efforts for the protection of environment through policies and programmes at both national and international levels.

The United Nations declarations such as Stockholm Declaration, 1972; Rio Declaration, 1992; and the treatises such as Vienna Convention for the Protection of the Ozone Layer, 1985, and Montreal Protocol on Substances that Deplete the Ozone Layer, 1987; United Nations Framework Convention on Climate Change, 1992; Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997; United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994; Convention on the Law of the Non-Navigational Uses of International Watercourses, 1997 are some of the notable laws for protecting the global environment. The Indian government also has formulated many laws for protecting the environment in addition to the provisions already existing in the constitution. The Environment Protection Act, 1986; National Green Tribunal established under the National Green Tribunal Act, 2010; Public Liability Insurance Act, 1991; and laws related to land, forest, air, water, biodiversity, preventing cruelty of animals and waste management are the notable ones.

The processes of global warming and climate change are the result of population explosion and human activities. Global warming is the observed century-scale rise in the average temperature of the Earth's climate system and its related effects ***(Shaftel, 2016)***, as part of climate change. Scientific evidence show that the climate system is warming **(Hartmann, et al., 2013).** Many of the observed changes since the 1950s are unprecedented in the instrumental

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temperature record and in paleoclimate proxy records of climate change over thousands to millions of years **(IPCC, 2013).** Future climate change and associated impacts will differ from region to region. Anticipated effects include rising sea levels, changing precipitation, and expansion of deserts in the subtropics **(Zeng and Yoon, 2009).** The global warming and climate change enhance for the increase of air-conditioning business. But, in turn, the increased use of air-condition has adverse significant impact on health.

Objectives

1. To understand the concept of climate change and the changing nature of air-conditioning business.
2. To examine the areas of air-condition usage and its linkage with health problems.

Literature Review - Climate change negatively impacts human health through heat stress and exposure to worsened air pollution, amongst other pathways. Indoor use of air conditioning can be an effective strategy to reduce heat exposure. However, increased air conditioning use increases emissions of air pollutants from power plants, in turn worsening air quality and human health impacts. Without intervention, approximately 5%-9% of exacerbated air-pollution-related mortality will be due to increases in power sector emissions from heat-driven building electricity demand. There is a need for cleaner energy sources, energy efficiency, and energy conservation to meet our growing dependence on building cooling systems and simultaneously mitigate climate change **(Abel, et al, 2018).**

India has been witnessing continuous growth across almost all major industrial and commercial sectors in the recent past. Besides metropolitan cities, the wave of development is also directed towards Tier 1 and Tier 2 cities, which are undergoing major revamp. Expansion of commercial space, more offices and corporate hubs coming up and introduction of organized retail outlets are driving the demand for HVAC *(Heating, Ventilation, and Air Conditioning)* installations across the country. Introduction of metro trains has created significant demand for HVAC systems. In addition to shopping malls and retail complexes, airports are also emerging as important centers for HVAC installations in the country. HVAC systems have become one of the core building blocks for modern infrastructure, encompassing various sectors like real estate. All these factors are expected to spur the market for HVAC systems in India.

As much of southern Ontario and Quebec bears through a humidex advisory and Toronto melts under an extreme heat alert, many are looking for relief from the sweltering outdoor temperatures. Air conditioners across these provinces are undoubtedly working overtime, but despite their relief from the scorching heat, air conditioners may not be the best option for health when it comes to cooling off.

Research shows that people who work in over air-conditioned environments may experience chronic headaches and fatigue. Air conditioning is notorious for increasing the symptoms of low blood pressure, arthritis, and neuritis, making pain management more difficult for those adamant on using their central air.

Long hours spent in air conditioned environments causes the skin to lose moisture; Those who spend a lot of time in an air conditioned environment become increasingly more intolerant of hot summer temperatures leading to an increase heat related deaths during heat waves. Breathing problems though car's AC may be a saving grace while stuck in traffic on a hot day but they are the worst offenders for circulating germs and micro-organisms that cause breathing problems. Researchers at Louisiana State Medical Center found eight types of mould living inside 22 out of 25 cars tested. Air conditioners are also known to circulate air-borne diseases such as Legionairre's Disease, a potentially fatal infectious disease that produces high fever and pneumonia **(Bogart, 2018).**

Data and Method - This study uses the secondary data from Statista research in India from 2013-2020. Bi-variate analysis is used to represent the emerging findings from this study.

Discussion - According to India HVAC Market Forecast and Opportunities, 2019, the HVAC market in India is forecasted to reach US$ 3.97 billion by 2019 on account of changing lifestyle, increasing per capita income, and rising expenditure by consumers on comfort solutions. The Indian HVAC market is also expected to witness growth on account of rising investments by Corporate India. Major companies offering HVAC systems in the Indian market are Daikin, Blue Star, Voltas, Carrier and ETA. India HVAC market is expected to cross $7 billion by 2022. (Source: www.techsciresearch.com/news/2884-hvac-market-in-india-to-surpass-7-7-billion-by-2022.html)

Growing infrastructure-based developments, technological advancements and increasing tourism are expected to positively influence Indian HVAC market over the next five years. Moreover, extreme climatic conditions, rising disposable income, growing construction activities in both commercial and residential sectors coupled with various government initiatives aimed at improving energy efficiency are some of the other major factors expected to boost India HVAC market during the forecasted period.

The increasing market size of air conditioners has been rising rapidly in India from 1.24 billion dollars in 2013 to 1.74 billion dollars in 2016 and is estimated to increase to 3.73 billion U.S. Dollars in 2020. **(Table 1, Fig 1.)** The rising use of air conditioners is bound to have adverse impact on the health of human beings.

Air-conditioning and Human Health - Most of the AC system gives importance to human comfort neglecting health aspects. As it is not possible to stay in conditioned space for 24 hrs, one has to undergo sudden change in the exposed environment. Thus our internal body programming gets confused. It is yet to be medically concluded on its effect on the body when it is periodically undergoing sudden

changes in climatic conditions. But there are few obvious observations. One of middle Eastern city, with summer desert temperature reaching 50°C and winter reaching 5° C. is now with full of centrally air-conditioned buildings where the new generation is spending their time. Old generation who spent their life in desert friendly village home, with their body undergoing annual temperature variation, through their life time, showed surprising fitness in their nineties. At the same time, their children and grandchildren who are fond of keeping the thermostat at 21°C, had the need to visit hospitals regularly.

There are many adverse effects of use of air-conditioning on health.

1. **Weaker Immunity-** Brisbane Air conditioning creates an artificial change in temperature which is unhealthy for human immunity causing weakening of immune system. People who frequently switch between extreme temperatures by staying inside home and office and later outside in scorching heat fall sick more frequently for no apparent reason.

2. **Feeling constantly fatigued-** When temperature of air conditioning is set very low, it causes internal shivering in a person's body and when that individual works overtime it produces more heat causing constant fatigue which is the most crucial negative health effect of air conditioning.

3. **Sinusitis-** According to the researchers, people who spend more than four hours in air conditioning environment are more likely to get diagnosed with sinusitis infections as the chilling cold air tend to harden or dry the mucous gland.

4. **Dryness of eyes-** Air conditioning environments tend to dry out your eyes causing irritation of eyes, itchiness and tearing of eyes as the liquid of eyes get dry easily due to the cold temperature. Redness and swelling can also be caused due to over exposure to cold temperature.

5. **Viral Infections-** Another quite common negative health effect of air conditioning is getting viral infection which is ultimately due to weaker immunity. Air conditioning is a process in which there is no fresh air circulation rather the old air gets circulated over and over again transmitting bacteria and viruses of cold, flu from one individual to another.

6. **Breathing Problems-** When the air conditioners are not cleaned properly and frequently and the filters are not changed, all kinds of bacteria and fungi breed in the air conditioning machines. This is caused due to the build-up up of moisture in the coils and ducts of condensation that forms while the cool air passes through. When these tiny microorganisms are air-borne, they lead to a multiple breathing problems including some dangerous infections such as pneumonia and Legionnaire's disease.

7. **Skin dryness-** Cold air environments can be a sole reason behind dry skin. Cold air produced by the air conditioners significantly dry out skin cells by damaging and creating fine lines making skin rough and dull.

8. **Allergy-**The negligence in cleaning the air conditioners can lead to accumulation of dust, bacteria and mould in the air circulating ducts which later on circulates infectious air causing skin irritations, redness of skin, itchiness and skin allergy which is another common negative health effect of air conditioning **(Mary, 2018).**

Conclusion - The findings from various studies show an increase in the use of air-conditioners and its adverse impact on health. Global warming and climate change have become inevitable. With the population explosion the demand increases, to fulfil these demands companies have to introduce better eco-friendly products, reduce pollution, reduce fuel consumption, and reduce carbon emission. Modern housing facilities including air-conditioners contribute more to factors worsening human health. Though the global warming and climate change boosted the increase of using air-conditioning, there is a necessity to understand the adverse impact of air-conditioning on health. Safeguarding the environment by preventing pollution and effective implementation of existing and innovative policies and programs will help sustaining and improving natural improvement, and subsequently will enhance for healthy environment avoiding or reducing use of air-conditioning.

Table 1 Increased Use of Air-conditioners in India

Year	Market size in billion U.S. Dollar
2013	1.24
2014	1.39
2015	1.55
2016	1.74
2020	3.73

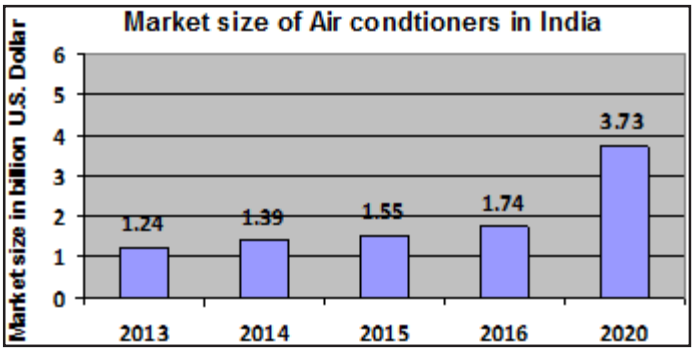

Fig 1 Source: www.statista.com/statistics/513827/india-air-conditioner-market-size/

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Namami Gange : Efficiency Deficit! What India Needs to Learn

Shubhra Shukla*

Introduction - India is a country rich in natural resources and in lieu of that, it has attracted invaders and settlers from ancient times. One key attraction apart from others for settlers was the country's rich water resources mainly in the northern plains. This led to boundless growth of population over the ages. The resulting agricultural, commercial and industrial activity led to dumping of huge amounts of domestic and industrial waste into the rivers resulting in acute water pollution.

The problem was recognised by the government of India in the early 1980s and the first river cleaning project called the Ganga Action Plan was introduced by the then Prime Minister Mr. Rajiv Gandhi in the year 1986. Since then various governments have pumped in millions of dollars into river cleaning projects with hardly any improvement in the state of the rivers.

With the launch of the Namami Gange project in 2014, there has been a rejuvenation of river cleaning activities. "The recent flurry of attention and elevated commitment to rejuvenation of the Ganga is most welcome", **(Ruhl and Connors, 2014)**. However, after almost four years, the project seems to be heading in the same direction as the previous ones. This study tries to examine the loopholes and some examples of similar projects, India can learn from.

Significance of the Study - India is a country with one of the highest densities of population. From ancient times people came and settled around rivers which provided the much needed fresh water. However, with time there was excessive concentration of population along river banks with unrestrained habitation, commercial and industrial activity.

All this has led to rampant pollution of the river waters by way of sewage, garbage consisting of plastic and all kinds of material and also industrial waste. The governments have been aware of the severity of the problem for decades and massive river cleaning projects have been underway. Though billions of rupees have been sanctioned for the river cleaning project, the rivers are still far from being clean.

Objective of the study - To understand the loopholes in the river cleaning projects in India and the takeaways for India from relevant examples.

Area of Study - Titled Namami Gange, the study investigates the river cleaning projects in India mainly for the rivers Ganga and Yamuna in the northern states of India. It cites relevant examples from India and other parts of the world.

The Ganga or the Ganges is one of the most important river systems in the world. It stretches 2,510 kilometres originating from the Gangotri glacier in the Himalayas and flowing east and falling into the Bay of Bengal. It binds five states in its course **(Ruhl and Connors, 2014)**. Almost one tenth of the world population (half a billion people) depends on this river basin. The average density of population in the area is over 500 per square kilometre. Many towns and villages are inhabited along the river basin **(Markandya and Murty, 2001)**.

The Yamuna is the largest tributary of The Ganga. It originates from the Yamunotri Glacier in the lower Himalayas. It travels a total distance of 1,376 kilometres in the north of India, before merging with the Ganga at Triveni Sangam, Allahabad. Nearly 57 million people depend on the Yamuna waters.

In the light of the Namami Gange initiated by the Narendra Modi government in 2014, it is imperative that the discussion be started again to avoid repeating the mistakes from the past.

Research Methodology -

Data - Both quantitative and qualitative sources of secondary data have been used for the research. Quantitative data substantiates the quantitative research by providing concrete evidence.

Research Philosophy - The research follows the philosophy of realism which is based on the concept of scientific enquiry which aims at maintaining objectivity.

Time Horizon - The time horizon in the research is mainly longitudinal as it studies the information over three decades.

River Cleaning Projects in India - The first major river cleaning project in India was launched in the year 1985. It was called the Ganga Action Plan or GAP. The main objective of phase I of the GAP was to improve water quality to acceptable levels by preventing the pollutants reaching the river. The second phase of the GAP was launched in the year 1993. The important tributaries of Ganga like Yamuna, Gomati and Damodar were heavily polluted and contributed to polluting the Ganga.

For this reason phase II of the GAP included cleaning

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of these tributaries in its objectives. The final cost of phase I of the project came to over 7 billion Indian Rupees (106 million USD) and that of phase II came to 4.2 billion Indian Rupees (63.9 million USD) **(Markandya and Murty, 2004)**. The GAP was launched again in 2009 giving the river Ganga the status of a national river. GAP was reconstituted with the National Ganga River Basin Authority (NGRBA). Exhibit 3 shows the expenditure allocated and incurred by various states under different river cleaning projects until 2014.

The CPCB (Central Pollution Control Board) report of 2013 reveals alarming levels of pollution in Indian rivers. Around 2723 million litres of untreated sewage is dumped into the River Ganga every day by the 36 major cities situated along the river alone.

The River Yamuna too has a similar story after plans being launched and huge sums of money sanctioned to clean up the river. However, the river ends up being even more polluted than it was earlier. The Yamuna too is considered a sacred river by the Hindus. It passes through some of the most densely populated areas of India. It flows through the states of Uttarakhand, Himachal Pradesh, Haryana, Delhi and Uttar Pradesh. Cleaning up of the Yamuna has not only been on the agenda of the Central government, State governments too have been making plans to clean up the river. The Delhi government has made multiple plans to clean up the Yamuna **(Lalchandani, 2012)** but River Yamuna kept becoming more and more polluted. The Delhi government failed to take a comprehensive view of the problem.

Similar cleaning projects have been underway for other tributaries of River Ganga and some other rivers in India but in most cases the projects continue to be far from achieving the desired results.

Examples India can learn from - Most of the countries have faced the problem of polluted rivers due to absence of any environmental awareness resulting in drainage of wastes of all kind in to the rivers. As the awareness grew, efforts to counter were initiated and were successful too. Thames for example, was declared biologically dead in 1957 **(Hardach, 2015)** and required a conscious effort from national and local bodies to improve the infrastructure and put strict regulations in place to ensure that the river comes back to life again.

A bigger job was to educate the citizenry of their responsibilities and implications of their actions in maintaining the lifeline, that is the river and sustain the work done, which is always ongoing. Today 120 species of fish, seals and even a stray whale could be found in the river Thames. Similar efforts have been made by many other countries as initially no one was aware that man in his hurry to progress was destroying the life source itself.

This study looks at the Singapore River cleaning project undertaken between 1977 and 1987. The river is confined within the city state but much closer to India physically and in culture and demography. The study rests on the assumption that the Singapore example can be relevant for a river like Ganga as entry points of all wastes is in and near population centres.

Singapore is strategically located at the crossroads of important trade routes. The Singapore River lies at the heart of Singapore providing an important channel to and from the city since it was founded in 1819. Gradually the river became heavily polluted. The main sources of pollution were squatter colonies, backyard industries, vegetable vendors and pig and duck farms. Untreated waste was being pumped into the waterways **(Dobbs, 2003)**. By the year 1977 the river was so heavily polluted, it had become black and smelly.

In 1977, the then Prime Minister and visionary Mr Lee Kuan Yeo gave a definite target to the Ministry of the Environment to clean the Singapore River and Kallang Basin **(Joan Hon, 1990)**. He had the environment ministry draw up a plan to clean up the river. Following the plan, 16000 families living in squatter colonies were relocated to public housing estates and 2800 industries were moved to industrial estates **(Lalchandani, 2012)**. In addition to this over 600 pig farms and 500 duck farms were either moved or phased out **(Dobbs, 2003)**.

The programme was conducted by the environment ministry but various other ministries, departments and statutory bodies were a part of a high level working committee looking into the implementation of the project. The active participation and coordination of all the parties involved, led to the successful completion of the project in 10 years. Although the total costs reached 200 million dollars, these included investment on estates built for rehabilitation and on the provision of amenities like piped and metered water supply and electricity **(Chou, 1998)**.

The success of the project is also attributed to the active participation of grassroots and NGOs. The key takeaways from the Singapore River cleaning project are; one ministry, the environment ministry was made responsible to carry out the project and to ensure that the project completes on time, all stakeholders worked in tandem following a well laid out plan. The sources of pollution were identified and eliminated.

When the cost of the Singapore River cleaning project is compared with its benefits, it reveals that it was an excellent investment which led to transformation of the face of Singapore. It led to Singapore becoming a model city in terms of urban planning and quality of life **(Tortajada, 2012)**. Identifying the need for people to be educated and aware in order to keep the river clean, the Singapore government started the Clean Rivers Education Program in 1987, run by the Waterways Watch Society (WWS) **(Choo, 2014).**

Another example of a successful river cleaning project is clean up of the Kuttemperoor River in Kerala. A tributary of Pampa and Achankovil rivers, Kuttemperoor has now had a rebirth, thanks to the efforts of 700 workers for 70 days **(John, 2017)**. The river that was once clean, 12 km long and 100 m wide, had been reduced to just 10-15 m by 2011. The main cause of this was pollution due to illegal

dumping of septic, plastic and other waste into the river and also sand mining. The villagers got into dirty water and proceeded step by step first to clean the weeds, then the plastic waste and finally the clustered thick waste at the bottom of the river. It was a herculean task and completing it in 70 days could not just have been achieved with money. It was an absolute will and commitment of the administration and the villagers which helped them achieve this.

Conclusion - The above discussion reveals that although various governments have undertaken massive river cleaning projects with funds allocated running into hundreds of crores of rupees, little has been achieved. Data from the ministry of environment and forests reveals that a sum of Rs. 6788 crores has been spent on various River Ganga cleaning projects in India since 1986. Looking at the worse state of the rivers in spite of such huge fund allocations is enough to prove that there is dire need for more efficient management of the river cleaning projects.

The Singapore River and the Kotemperoor River example discussed above provide ideal examples of how this mammoth task can be successfully implemented with the help of clear political will and efficient management. Both of these rivers cannot be fairly compared with the River Ganga which is more than 2500 kilometres long and passes through 5 states. A successful River Cleaning Project therefore, will involve coordination and participation of all state administrations.

The problem is further complicated by complex systems and procedures involving approvals and sanctions from various departments and at multiple levels of authority. This gives rise to red-tapism and corruption leading to inefficiency and wastage of resources.

Suggestions - River cleaning projects in India provide clear examples of how such projects should not be managed. Observing the causes of their failure and those of the success of other projects, some suggested measures can be taken.

Need for Political Will - A strong political will is desired. This will direct various stakeholders to work efficiently together and clear any possible roadblocks.

Professional Handling of the Projects - Management of the projects should be handled professionally. This will involve Continuous engagement of all stakeholders at all stages, timely sharing of Information, clear instructions, realistic targets and above all accountability.

The process will potentially involve the committed efforts of many departments and Organizations, "The Ganga's constituents are its inhabitants, its champions, its Religious leaders, its elected representatives, and all the people who value it as a Cleaner river" **(Ruhl and Connors, 2014)**.

The World Bank also suggests that the task of river cleaning should be delinked from line of authority of ministers and should be given to professional managers who focus on executing the task professionally. It says cities need to be strengthened as ultimately, they will be the custodians of sewage networks, treatment plants and waterfront management. **(Ruhl and Connors, 2014)**.

Availability of information regarding the project status, fund allocation etc. will not only assist better planning but this transparency will also ensure greater commitment and motivation from the team involved.

Effective use of Technological Advancement - The various river cleaning projects have attempted to collect and provide pollution data and to identify sources of pollution. According to the World Bank, "The global experience shows that we need good data, including, for example, on the share of point source versus non-point source pollution and on the share of the pollution-load generated by cities versus industries." **(Ruhl and Connors, 2014)**. Good data will lead to minimised wastage of effort and resources.

Since 2011, The World Bank also has been providing financial and technical assistance to India **(Ruhl and Connors, 2014)**. Incorporation of recent advancements in pollution control and much efficient machineries will further reduce wastage of time, money and resources. Effective planning will lead to overall development of the area. Rehabilitation and resettlement of inhabitants to new homes and providing them with basic amenities leads them to have a better quality of life **(Tortajada, 2012)**. Further, technology is to be used to educate the people on importance of clean source of water to ensure this to be sustainable.

Appendix -

Clean Ganga Project - Evolution -

- 1986 - The Congress Government launched the first phase of Ganga Action Plan (GAP) along selected stretches of 25 cities in U.P., Bihar and West Bengal.
- 1993 - GAP-II was initiated which included the tributaries- Damodar, Gomati and Mahanadi.
- 2009 - The government relaunched GAP, giving Ganga the status of a national river. It reconstituted GAP with National Ganga River Basin Authority (NGRBA) which included the cleaning of the entire river basin.
- 2014 - The Modi government launched the Namami Gange project with massive fund allocation for rejuvenation of the river.
- 2016 - The national Ganga Council was set up under the River Ganga (Rejuvenation, Protection and Management) Authorities order 2016. The order dissolved the the NGBRA. National Mission for clean Ganga was set up as the implementation wing.

Exhibit1 - **(See in the next page)**

Exhibit 2 - Allocation Expenditure in Ganga Clean Up Projects

Source - https://static-news.moneycontrol.com/static-mcnews/2017/07/Allocation-expenditure.png

Status of Progress Under National River Conservation Plan (As On 31-03-2014) (See in the last page)

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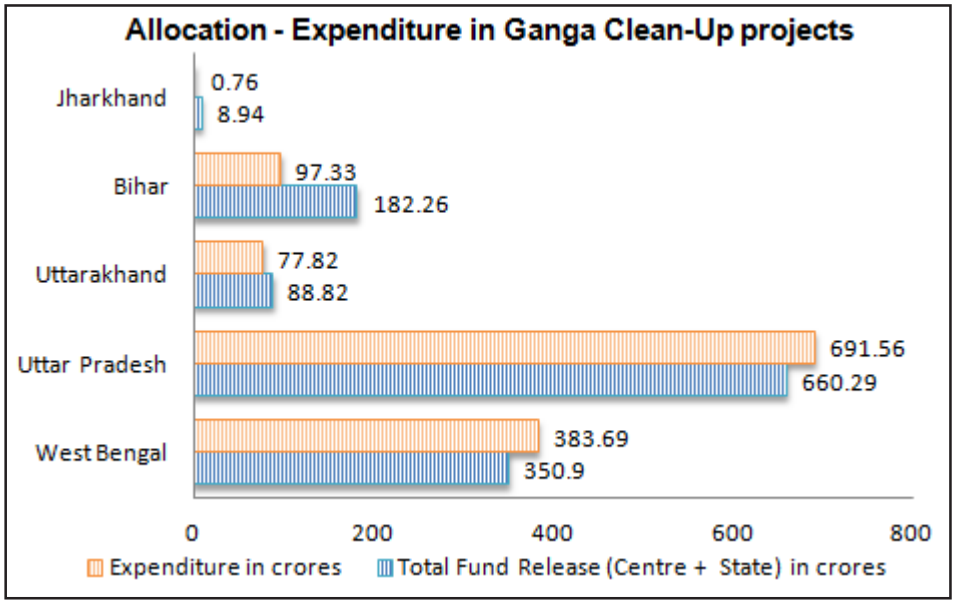
Exhibit 1 - Clean Ganga: Project Evolution Source:https://static-news.moneycontrol.com/static-mcnews/2017/07/Clean-ganga-1.png



Status of Progress Under National River Conservation Plan (As On 31-03-2014)

(Rs. In Lakh)

SI No	ACTION PLAN /STATE	COST OF SCHEMES SANCTIONED	No. OF SCHEMES SANCTIONED	No. OF SCHEMES COMPLETED	FUNDS RELEASED BY GOI	EXPDT. INCURRED (BY STATE)
		31-03-2014	**31-03-2014**	**28-02-2014**	**31-03-2014**	**31-02-2014**
(i)	**Yamuna Action Plan Phase-I**					
1	DELHI	18064.08	12	12	17714.54	16069.53
2	UTTAR PRADESH	28266.5	146	146	24001.5	27552.47
3	HARYANA	24220.27	111	111	17870.4	24775.72
	SUBTOTAL	70550.85	269	269	59586.44	68397.72
	Yamuna Action Plan Phase-II					
	DELHI	48967.88	14	8	27479.53	57202.37
	UTTAR PRADESH	12677.15	6	6	9862	13785.73
	HARYANA	6342.89	16	15	5290.43	6001.42
	SUBTOTAL	67987.92	36	29	42631.96	76989.52
	Yamuna Action Plan Phase-III					
	DELHI	0	0	0	0	0,00
	HARYANA	21787	2	0	4820	7848.1
	SUBTOTAL	21787	2	0	4820	7848.1
	TOTAL (YAMUNA)	**160325.77**	**307**	**298**	**107038.4**	**153235.34**
(ii)	**GOMTI ACTION PLAN PHASE -I**					
	UTTAR PRADESH	5575.09	31	31	4314.72	5990.95
	TOTAL	**5575.09**	**31**	**31**	**4314.72**	**5990.95**
	GOMTI ACTION PLAN PHASE -II					
	UTTAR PRADESH	26304.22	30	28	17974.46	41469.93
	TOTAL	**26304.22**	**30**	**28**	**17974.46**	**41469.93**
	TOTAL (GOMTI)	**31879.31**	**61**	**59**	**22289.18**	**47460.88**
(iii)	**DAMODAR ACTION PLAN**					
4	JHARKHAND	41.44	4	4	19.81	36.99
5	WEST BENGAL	398.41	10	10	10.74	392.2
	TOTAL	**439.85**	**14**	**14**	**30.55**	**429.19**
(iv)	**MAHANANDA ACTION PLAN**					
	WEST BENGAL	5488.23	3	1	500	5054.19
	TOTAL	**5488.23**	**3**	**1**	**500**	**5054.19**
(v)	**GANGA ACTION PLAN – II (MAIN STEM + SUPREME COURT TOWNS)**					
	UTTAR PRADESH	19420.31	43	33	16928.77	18999.63
6	UTTRANCHAL	7062.15	44	32	5063.04	5479.33
	JHARKHAND	20.67	2	2	0	24.57
7	BIHAR	395.18	18	14	315.13	304.73
	WEST BENGAL	23560.86	202	181	25502.63	21770.54
	CETP (West Bengal)	8646	5	2	4401	3952
	TOTAL	**59105.17**	**314**	**264**	**52210.57**	**50530.8**
(vi)	**NATIONAL GANGA RIVER BASIN AUTHORITY (NGRBA)**					
	UTTAR PRADESH	191436	13	0	49875	51347
	UTTRANCHAL	25121	16	1	5892	5857
	BIHAR	116038	7	0	12651	7649
	JHARKHAND	9936	1	0	626	0
	WEST BENGAL	93421	28	15	21538	18680
	TOTAL	**435952**	**65**	**16**	**90582**	**83533**
	GAP -II (TOTAL)	**693190.33**	**764**	**652**	**272650.7**	**340243.4**

Exhibit 3 - Status of progress under National River Conservation Plan
Source: National Mission to Clean Ganga (2018)

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Human Population and Carbon Emissions in ESCAP Region

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Abstract - Population growth is an important and indispensable factor in the study of environment and its impact on various socio-economic, and health aspects of human life. Population growth has a definite contribution in the increase of carbon emissions and subsequently has an adverse impact on natural environment and health of the human population to a greater extent. In the scientific, democratic, modern welfare State, though the transportation need and the necessity of increasing the industry oriented products are inevitably existing, various government and non-government organizations are obliged to undertake various measures for curbing the over population growth and reducing the carbon emissions level in order to ensure sustainable development both at national and global levels. Keeping this in view, this paper makes an attempt to study the levels, change, causes and consequences of human population growth leading to carbon emissions among the countries of ESCAP region. Using the data from world population data sheets from Population Reference Bureau, the results reveal that the total population of the Asia-Pacific region stood at 4.3 billion, which is 60 per cent of the world's population. Among 62 ESCAP countries, the levels of human population and carbon emissions were high in China in 2013, and the change in the population and carbon emissions was high in Afghanistan during 1992-2013. While, 59 countries showed both low levels of human population and carbon emissions, 30 countries demonstrated medium levels of change both in human population and carbon emissions. As the population growth is one of the prime causes of carbon emissions and both these components have serious adverse impact on all the aspects of human life, the demographers and environmentalists have a greater role in controlling population growth and reducing the carbon emissions by efficient implementation of existing policies and programs with the help of some innovative approaches.

Keywords - Population, Carbon emissions, ESCAP region.

Introduction - Human population has been given significant importance among all the living creatures in the universe. The sacred texts of most of the religions demonstrate that the whole environment including light, sky, land, water, plants, sun, moon, stars, day, night, birds and animals were all God's blessings to humanity and given to the whole earth to rule over, care for, and cultivate; Air, water, sky and earth were created for the people. The Population Media Centre observes, "we cannot have a sustainable planet without stabilizing population." Social justice is the process of ensuring that individuals fulfill their societal roles and receive what was their due from society **(Jowett, 1885)**. We are in the realm of transformation for population stabilization and sustainable development. Achieving environmental sustainability for sustainable development - Environment is at the centre of the sustainable development (United Nations Environment Programme) **(UNEP, 2016)**. Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs **(WCED, 1987)**.

Sustainability is the endurance of systems and processes. The organizing principle for sustainability is sustainable development, which includes the four interconnected domains: ecology, economics, politics and culture **(James, et. al., 2015)**. Sustainability science is the study of sustainable development and environmental science ***(Lynn and Eda, 2014)***. It is very difficult to understand the relationship between population and environment as both are interrelated and complementary and supplementary to each other. Two specific areas illustrate the challenges of understanding the complex influence of population dynamics on the environment: land-use patterns and global climate change **(Hunter, 2000)**.

It is the obligation of a researcher both in the fields of demography as well as environmental science to study the relationship between environment components and population growth. Keeping this in view, this paper tries to examine the relationship between human population growth and carbon emissions in the countries of ESCAP region.

Literature Review

'Environment' includes (a) Water, air and land; (b) The inter-relationship which exists among and between (i) water, air, land and (ii) human beings, other living creatures, plants,

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microorganisms and property **(MoEF, 1986)**. Overpopulation growth is an important cause for carbon emissions. Overpopulation growth leads to adverse impact.

The overpopulation growth leads to many adverse impacts on demographic, social, psychological, economic, health and environment conditions. Overpopulation growth leads to environmental degradation. It is also emitted from natural respiration and degradation processes and from various industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured, thus having a Global Warming Potential of 1 **(MRCSD, 2013)**. CO_2 emissions sources include emissions from energy industry, from transport, from fuel combustion in industry, services, households, etc. and industrial processes, such as the production of cement. Carbon Emissions Must Be Cut 'Significantly' by 2020, Says United Nations University (2013) Annual Report.

Carbon dioxide is a 'greenhouse gas,' and is one of the primary causes of human-induced climate change. There are no known serious direct health effects from CO_2. However, the indirect health effects of climate change are numerous. Sustainable environment is necessary to ensure sustainable development. The power of population is indefinitely greater than the power in the earth to produce subsistence for man. If population grows much faster than food production, the growth is checked in the end by famine, disease, and war, a process that is called the Malthusian Crisis ***(Malthus, 1798)***. *Success on these two fronts would make other challenges, such as reversing the deforestation of Earth, stabilizing water tables, and protecting plant and animal diversity, much more manageable. If we cannot stabilize climate and we cannot stabilize population, there is not an ecosystem on Earth that we can save" (World Watch Institute).* Population, global warming and consumption patterns are inextricably linked in their collective global environmental impact (EarthTalk).

Objectives

1) To understand the levels and change of population and carbon emissions in ESCAP region.
2) To examine the relationship between population growth and carbon emissions in ESCAP region.

Data And Method - This study uses the data from 1992 World Population Data Sheet and 2016 World Population Data Sheet published by Population Reference Bureaue. Simple bivariate analysis was used to realize the objectives. The percentage (2013) and percentage change (1992-2013) in population and carbon emissions were calculated for world major regions and 62 ESCAP member countries to study the levels. The percentage and percentage change have been groupled into low, medium and high categories to examine the relationship between population and carbon emissions.

Results And Discussion - The surplus population growth has the adverse effect on demographic, socio-economic, health and environmental conditions to a greater extent. This study discusses the relationship between population and carbon emissions in terms of their levels and change during 1992-2013 using data from 1992 World Population Data Sheet, 2013 World Population Data sheet and 2016 World Population Data Sheet, published by Population Reference Bureau.

The world records 7137 million population and 9776 million metric tons carbon emissions in 2013. The percentages of population and carbon emissions are more in less developed region (82.7% and 63.6%) as compared to that of more developed region (17.3% and 36.4%). The percent change in population and carbon emissions also reveals the same pattern (37.3% and 161.8% respectively in less developed region and 7.7% and -4.7% respectively in more developed region) during 1992-2013. Among the major regions of the world, Europe has been found with more percentage of population and carbon emissions (60% and 55.9% respectively) followed by America, Africa, Asia and Oceania. The percentage of population and carbon emissions in China was 29.0 and 39.9 respectively in the year 2013. The percentage change during 1992 to 2013 is 14.8 for population and 280.2 for carbon emissions. More or less all the major regions of the world showed positive association between population and carbon emissions in terms of both levels and change. (Table 1, Figure 1a and Figure 1c). As far as the percentage changes in the population and carbon emissions are concerned, Asia pronounced more (29.9% and 157.6%) followed by Africa, Oceania, America and Europe (Table 1 and Figure 1c).

Among the 62 ESCAP member countries, 15 were considered for the analysis based on the considerable proportions of population and carbon emissions. It was found that China was found with more percentages of population and carbon emission (29% and 39.9% respectively) followed by United States of America, India, Russia, Japan, Iran, Korea PDR, Indonesia, United Kingdom, Australia, Turkey, Afghanistan and Kazakhstan (Table 1 and Figure 1b). The percentages change of population and carbon emissions are more pronounced in Afghanistan (127% and 1350% respectively) followed by India, Turkey, Indonesia, Iran, Australia, United States of America, Korea PDR, Thaniland, China, United Kingdom, France, Kazakhstan, Japan and Russia (Table 1 and Figure 1d). Besides using the above analysis based on descending order of these four variables such as percentage and percentage change of population and carbon emissions, all the 62 ESCAP member countries were classified into three categories low, medium and high.

Based on the averages of these 4 variables, it was found that two countries, Indonesia and India were above the averages, and 13 countries such as American Samoa, Australia, French Polynesia, France, Micronesia-F.S., Hong Kong, China, Kazakhstan, Korea (Republic), Netherlands, New Zealand, Tonga and Samoa are below the averages in all these 4 variables. These show a strong positive association between human population and carbon

emissions among the countries of ESCAP region. However, the United States of America was found with low level of percentage of population and medium level of percentage of carbon emissions; and India with high level of percentage of population and low level of carbon emissions, which do not reveal such relationship. Out of 62 countries, 59 had low levels in the percentages of both population and carbon emissions. China had high levels in both the percentages of population and cabon emissions and revealed a positive association. However India with high and low levels, and USA with low and medium levels in the percentage of population and percentage of carbon emissions, do not show any strong association between human population and carbon emissions (Table 2A).

While thirty countries falling in medium category, Afghanistan falls in high category in both in percentage change of population and carbon emissions showing strong association (Table 2B), China demonstrated high level of population and carbon emissions, Afghanistan witnessed high level of change in the population and carbon emissions. Overall, 31 countries (50%) demonstrated strong positive association between human population and carbon emissions irrespective of their levels (Table 2C).

The statistics reveal a positive relationship between population and carbon emissions. The significant decline of carbon emissions in more developed countries shows that there has been increasing efforts among more developed countries in sustaining and improving conducive environmental conditions.

Conclusions - Population growth has significant adverse impact on environment including increase of carbon emissions. The major world regions and most of the ESCAP countries showed positive association between population and carbon emissions both in terms of their percentage and percentage change. Out of 62 countries, 60 countries showed strong association between population and carbon emissions as far as the percentages of population and carbon emissions are concerned. In terms of percentage change in both the variables, 31 countries showed strong association between population and carbon emissions.

One of the largest environmental effects of human population growth is the problem of global warming. It is certainly necessary to realize the fact postulated by Thomas Robert Malthus, English Economist and Demographer who is best known for his theory that population growth will always tend to outrun the food supply and that betterment of humankind is imposible without sterm limits on reproduction. It is very much essential for the world regions and nations irrespective of their level of development to maintain the population size feasible for supporting and viable environment in order to ensure the human welfare and global peace.

Table 1
Table 2A,2B,2C
Figure 1a,1b,1c,1d
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Table 1 : Percentage (1992) and percentage change (1992-2013) of Population and Carbon emissions, World Major Regions and Selected Countries

World/Regions/Countries	Percentage (2013)		Percentage change(1992-2013)	
	Population	Carbon emissions	Population	Carbon emissions
WORLD	100.0	100.0	31.0	60.0
Major Regions				
More Developed Region	17.3	36.4	7.7	-4.7
Less Developed Region	82.7	63.6	37.3	161.8
Africa	10.3	16.9	69.5	83.1
America	13.4	22.2	29.6	17.8
Asia	15.7	3.7	29.9	157.6
Europe	60.0	55.9	2.0	-17.2
Oceania	0.5	1.3	37.5	43.2
Selected ESCAP countries				
Afghanistan	0.7	0.1	127.0	1350.0
Australia	0.6	1.5	31.8	41.0
China	29.0	39.9	14.8	280.2
France	1.3	1.3	11.2	-8.9
India	26.8	7.9	41.1	191.1
Indonesia	5.3	1.9	34.2	136.8
Iran	1.6	2.4	32.9	169.7
Japan	2.7	4.8	2.4	10.6
Kazakhstan	0.4	1.0	4.4	-2.6
Korea PDR	0.5	2.3	19.3	108.5
Russia	3.0	7.0	-3.2	-13.9
Thailand	1.4	1.2	17.8	176.6
Turkey	1.6	1.3	35.9	111.0
United Kingdom	1.4	1.8	12.4	-17.7
USA	6.6	20.2	22.6	5.6

Source: Population Reference Bureau (1992 World Population Data sheet, 2013 World Population Data Sheet, and 2016 World Population Data Sheet)

Table 2A : Countries with Low Population (%) (0.1-9.7) and Low Carbon Emissions (%) (0.1-13.4)

Sr.#	Country	Sr.#	Country	Sr.#	Country
1	Afghanistan	21	Kazakhstan	41	Pakistan
2	Armenia	22	Kyrgyztan	42	Philippines
3	American Samoa	23	Cambodia	43	Palau
4	Australia	24	Kiribati	44	Papua New Guinea
5	Azerbaijan	25	Korea (Republic)	45	Korea DPR
6	Bangladesh	26	Lao PDR	46	Russian Federation
7	Brunei Darussalam	27	Sri Lanka	47	Singapore
8	Bhutan	28	Macao, China	48	Solomon Islands
9	Cook Islands	29	Maldives	49	Tongo
10	Fiji	30	Marshall Islands	50	Thailand
11	French Polynesia	31	Myanmar	51	Tajikistan
12	France	32	Mangolia	52	Turkmenistan
13	Micronesia Federal States	33	Northern Mariana Islands	53	Timor-Leste
14	United Kingdom	34	Malaysia	54	Turkey
15	Georgia	35	New Caledonia	55	Tuvalu
16	Guam	36	Niue	56	Uzbekistan
17	Hong Kong, China	37	Netherlands	57	Viet Nam
18	Indonesia	38	Nepal	58	Vanuatu
19	Iran	39	Nauru	59	Samoa
20	Japan	40	New Zealand		

China with High Population (%) (19.5-29.0) and High Carbon Emissions (26.7-39.9)
Source: Population Reference Bureau (2016). 2016 World Population Data Sheet.

Note: India- High in percentage of population and low in percentage of carbon emissions; USA- Low in percentage of population and Medium in percentage of carbon emissions.

Table 2B : Medium Population (% Change) (26.7-76.8) and Medium Carbon Emissions (% Change) (397.8-873.9)

Sr.#	Country	Sr.#	Country	Sr.#	Country
1	Australia	11	Lao PDR	21	Palau
2	Bangladesh	12	Macao, China	22	Papua New Guinea
3	Brunei Darussalam	13	Maldives	23	Singapore
4	Bhutan	14	Mongolia	24	Solomon Island
5	Indonesia	15	Malaysia	25	Turkmenistan
6	India	16	New Caledonia	26	Timor-Leste
7	Iran	17	Nepal	27	Turkey
8	Kyrgyzstan	18	New Zealand	28	Uzbekistan
9	Cambodia	19	Pakistan	29	Viet Nam
10	Kiribati	20	Philippines	30	Vanuatu

Afghanistan High Population (19.5-29.0) and High Carbon Emissions (874.0-1350.0) (% Change)
Note: The countries remaining other than the ones mentioned above do not show any relationship.

Table 2C : Countries showing positive relationship between human population and carbon emissions in levels and change

Sr.#	Country	Sr.#	Country	Sr.#	Country
1	Afghanistan	12	Lao PDR	22	Palau
2	Australia	13	Macao, China	23	Papua New Guinea
3	Bangladesh	14	Maldives	24	Singapore
4	Brunei Darussalam	15	Mongolia	25	Solomon Islands
5	Bhutan	16	Malaysia	26	Turkmenistan
6	China	17	New Caledonia	27	Timor-Leste
7	Indonesia	18	Nepal	28	Turkey
8	Iran	19	New Zealand	29	Uzbekistan
9	Kyrgyztan	20	Pakistan	30	Viet Nam
10	Cambodia	21	Philippines	31	Vanuatu
11	Kiribati				

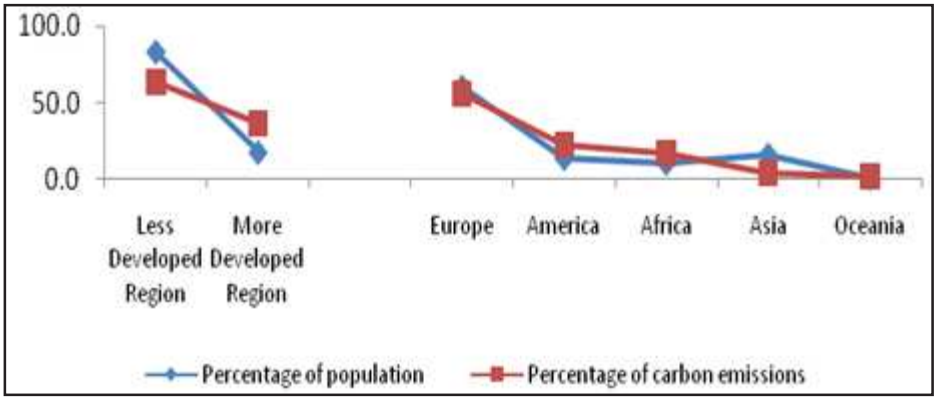

Figure 1a: Percentages of population and carbon emissions, world major regions, 2013

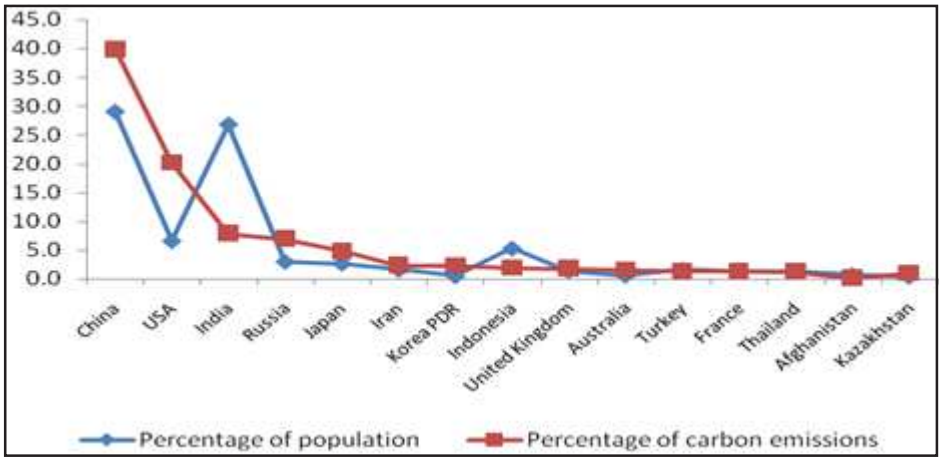

Figure 1b: Percentages of population and carbon emissions, selected ESCAP countries, 2013

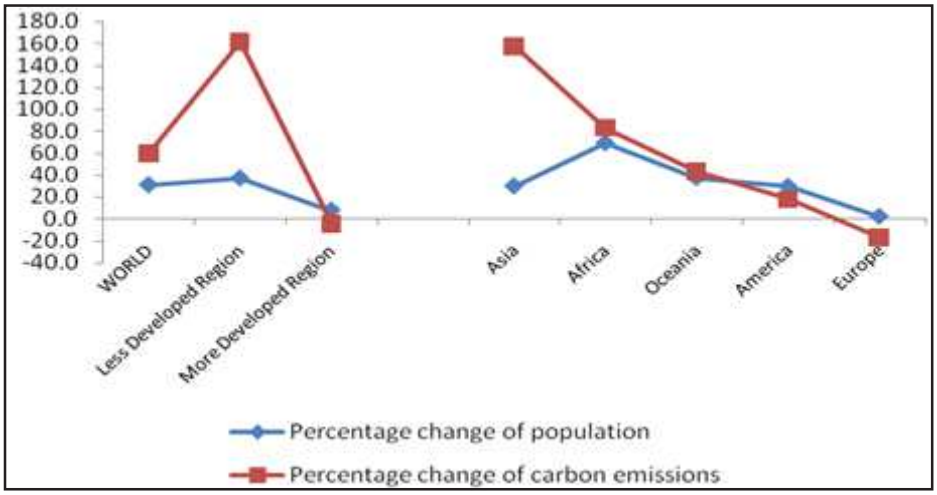

Figure 1c: Percentage change of population and carbon emissions, world major regions, 1992-2013

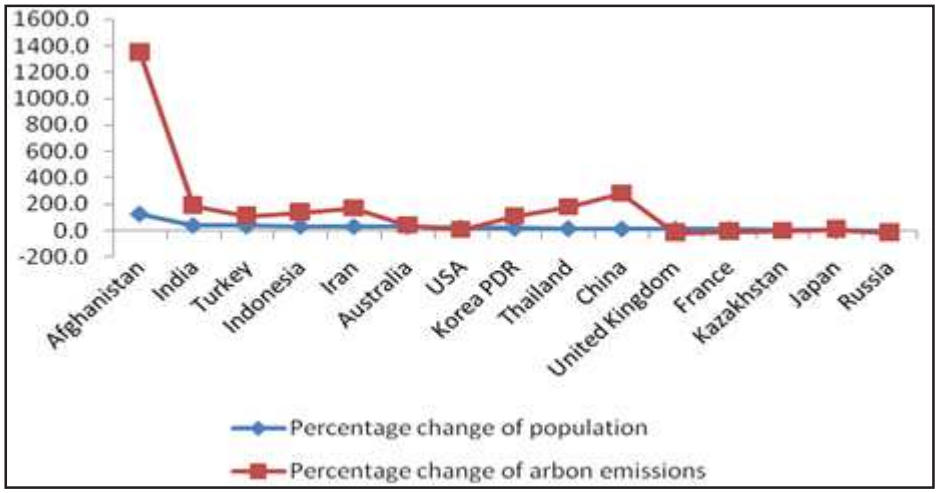

Figure 1d: Percentage change of population and carbon emissions, selected ESCAP countries, 1992-2013

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Pollution and Protection of Air, Soil and Water Environment- A Legal Perspective

Jaymangal Dhanraj*

Abstract - The Constitution of India is one of the few constitutions of the world that has provisions on environmental protection on both, the State through Directive Principles of the State Policy and on citizens through Fundamental Duties. This has been complimented by Judicial Activism in the form of interpretation of Art. 21 for the protection of environment and making polluters to pay for the damage caused to the environment.

A few decades ago, there was no exact environmental policy in the world till, as late as, at the beginning of the 70's. The events that took place in this decade gave new dimensions to environment protection. The first and foremost was the Stockholm Declaration, 1972 i.e. The United Nation's Conference on Human Environment that was held at Stockholm (Sweden) in June 1972; called the 'Magna Carta of Our Environment'. A total number of 113 nations attended the said Conference including India.

A wide range of legislation was enacted covering the whole range of subjects affecting environment and ecology in order to curb the menace of global climate change. The laws which have been enacted include the Environment (Protection) Act (EPA) 1986 as umbrella legislation, the Forest (Conservation) Act (FCA) 1980, the Wild Life (Protection) Act (WLPA) 1972, The Water (Prevention and Control of Pollution) Act 1974, The Air (Prevention and Control of Pollution) Act 1981 and many other Acts and various policy initiatives as well. The issues relating to the prevention of pollution of water, soil and air and the preservation of them is sought to be addressed through these legal documents and the judiciary also in its various landmark judgments issued the directives to the government to achieve the goals of abatement of pollution and preservation of water, soil and air. The Indian government, while addressing the issues of pollution of water, soil and air has not only passed legislation but it is evident to see that various agencies like Pollution Control Board, tribunals like Green Tribunal to monitor the implementation of the laws and provide measures to meet the ends, are established.

Key Words - Environment, pollution, protection, legislations, policy, judiciary,
judgments - *When men are Pure, laws are useless; When men are corrupt, laws are broken.*
- Benjamin D Israeli

Introduction - The development of science and technology has proved to be a boon for the growth and advancement of human beings is a proved fact and we all are enjoying the fruit of it through a comfortable life. The benefits and advantages of modernization is not a matter of debate in terms of utility, but there is serious concern on the other side of this development which is calling an acute attention of mankind to the side effects of modernization and industrialization. The recent past has been increasingly showing certain symptoms that rapid industrialization and modernization on one hand accelerated growth of life but on the other hand, it is adversely affecting the natural flora and fauna of the environment and ecology due to variety of contributory factors which are an outcome of the same. Out of the various elements contributing to the degradation of environment as a whole is pollution of soil water and air coupled with other contributing factors.

Environment Pollution - The dictionary meaning of the term pollution is 'the presence in or introduction into the environment of a substance which has harmful or poisonous effects.'

It is the process which brings about changes adversely affecting normal lifestyle, by environment pollution through contamination of the surroundings.

The contaminating elements i.e. the pollutants are main culprits generally forming to be waste materials of different forms and being the key elements in the pollution causing disturbance to the ecology and the environment. The accelerated rate of modernization and industrial activities is reaching to the height in relation to its contribution to contamination of three major parts of environment i.e. water, air and soil and adversely affecting human life on such a large scale that it has become a matter of concern to the world community.

Water, Air and Soil Pollution: Causes and effects -

Water Pollution - A contamination of water resources and

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water bodies like river, lakes, oceans, streams or the groundwater caused by human activities through deposition of pollutants directly or indirectly and any alteration or change in the properties of water causing harmful consequences to life and environment can be understood as pollution of the natural water.

Water pollution of different water bodies can be caused due to variety of reasons and through contamination of different elements into it. Factors that cause the contamination of foreign bodies in natural water may range from domestic wastes, agricultural fertilizers and industrial wastes of hazardous chemicals and metals, the consumption of which results into damage to human and natural fabric of eco system.

The adverse effects of water pollution are not limited to mankind alone, but it badly affects aquatic life and ecosystem as well. There are various adverse effects of water pollution which can be enumerated covering a wide range of disorders and illnesses caused to human beings and environment both.

Air Pollution - An important element of environment is air. The natural air which is healthy for the respiration of human beings and other species in one sense and the healthy air covering the atmosphere to protect the earth form the ultra violate sunrays plays an important role in maintaining temperature on earth.

But the excessive burning of fossil fuels like coal, oils, natural gas and other fuels for the purpose of electricity generation and for production of power for vehicles, polluting the air cover and damaging the atmosphere in general and human health and in particular through increase in respiratory diseases.

Major pollutants which become hazardous if contaminated in the air are chlorofluoro carbons, carbon dioxide, carbon monoxide emitted due to incomplete combustion of fuel, carbon monoxide emitted from motor vehicles, sulphur dioxide produced by volcanoes and various industrial emissions, nitrogen oxides and many others.

Effects of Air Pollution - The air pollution is becoming the reason for global warming by increasing the temperatures day by day due to green house effect. The phenomenon of level of greenhouse gases going called global warming, results in global climate change. The global climate change is a basic cause of rising sea level, disruption of agriculture and food productivity and livelihood of plants and animals including human being. Formation of photochemical smog through combining of pollutants like hydrocarbon and nitrogen oxides in the presence of sunlight, acid rain and depletion of the ozone layer are some of the dangerous effects caused to the atmosphere due to air pollution.

Not only this but air pollution has the hazardous effect on human health by causing various respiratory ailments like bronchitis, asthma, tuberculosis, lung cancer and many others. Due to consumption of some pollutants through air, the central nervous system gets affected; problems in liver, kidney and even brain damage can be caused.

Soil Pollution - The soil is also polluted through various human activities like industrial activity, agricultural chemicals and improper disposal of wastes. The soil is contaminated through penetration of injurious chemicals and pesticides resulting in deterioration of soil quality in terms of its use. The adulteration of soil with chemicals, fertilizers, oils, sanitary wastes, sewage effluents, nuclear wastes automobile wastes and many other human activities. The unscientific and unhealthy planning of waste management is the main cause to allow hazardous wastes to come into contact with the soil and damaging its healthy fabric.

This pollution of the soil has resulted in the huge damage to the ecological balance and the health of the living organisms, animals, plants and humans as well. It reduces the productivity and fertility of the soil by making it unfit for cultivation, creates toxic dust, and produces an imbalance in the fabric of earth.

Legislative and policy response in India -

Constitutional Provisions - The Constitution of India, in the Directive Principles of State Policy makes it clear for the policy makers to make serious efforts to protect and preserve the natural environment and wild life (**Article 48A, The Constitution of India**). The provisions contained in the chapter of fundamental duties (**Article 51A (g), The Constitution of India**) imposes a duty on the citizens as well to preserve and protect the environment.

Not only this, it also provides that the state shall endavour[3] to foster respect for international law and treaty obligations in the dealings of organized people with one another; and thereby enable the Indian government to enact laws in accordance with international agreements, treaties, protocols, etc. to which India is party.

In response to the various treaties and agreement entered into, the Indian Government also took the effective legislative measures in order to provide a legislative control and regulation on the environment pollution in general and pollution of the air, water and soil in particular.

Water (Prevention and Control of Pollution) Act 1974 - In the year 1974, just after the Stockholm Declaration, Indian government came up with an enactment on the prevention and control of the water pollution. The features of the Act and objectives to seek are clear indication that the contamination of the water bodies due to hazardous chemicals and other material needs to addressed at the earliest. Water Act came into effect in 1974 to prevent pollution of water by industrial, agricultural and household activities.

The Act empowers the board to take water samples for analysis, govern discharge of sewage, trade effluents, study or inspect appeals, revision of policies, set minimum and maximum penalties, publication of names of offenders, establish or recognize water testing laboratories and standard testing procedures.

The Air (Prevention and Control of Pollution) Act, 1981 An Act to prevent and control Air pollution was enacted in

1984 which provides for the establishment of The Central Pollution Control Board (CPCB) and state boards for implementation of rules under the Act.

The Air Act aims at prevention, control and abatement of air pollution, for this purpose pollution beyond certain limits due to various pollutants discharged through industrial emission is monitored by Pollution Control Boards.

The Environment Protection Act, 1986 - In response to the Stockholm Declaration of 1972, a law by the name of Environment Protection Act was passed in 1984, containing 26 sections divided in four chapters, to take appropriate and effective steps for the improvement and protection of environment as a whole and to prevent hazardous effects of environment degradation to human beings, living creatures and to ecology, covering the whole range of environment. Hence the Act is known as Umbrella Legislation.

Central Government empowered with rule making powers - Section 2 of the Act empowers the Central Government to make rule in relation to the following important matters and this happened for the first time in the history of legislation concerning environment.

In this way, it becomes clear that the Indian legislative response to the issue of global climate change and the protection of environment through pollution control and prevention deserves appreciation considering the timely taken steps and the means and mechanism provided through the various pieces of legislation coupled with the penal provisions for the defaulters. In support of the need expressed and felt by the legislature, the Indian judiciary has also responded to the call for environment protection in a positive way.

Environment Pollution and Judicial trend in India - Considering the serious threat of the environment pollution to the human beings, natural flora and fauna of the environment including living orgasms, animals, plants and trees and the wild life, the judiciary has also taken a equally serious not of the same and through various judgments expressed the concern to the extent of imposing harsh penal liabilities on the defaulters.

In many cases the Apex Court has interpreted the legislations even going beyond the text and introduced various principles to establish certain norms in order to prevent and control the environment pollution.

In a landmark judgment in Oleum Leakage Case 4 the principle of Absolute Liability was laid down by the Supreme Court of India. The Court held that the permission for carrying out any hazardous industry very close to the human habitation could not be given and the industry was relocated.

In another landmark judgment delivered by Justice Jeevan Reddy in Indian Council for Enviro-Legal Action vs. Union of India, 5 the Apex Court laid down by adopting another important principle known as 'Polluter Pays Principle' and the court held that the financial costs of preventing or remeding damage caused by pollution should lie with the undertakings which cause the pollution.

In Damodar Rao v. S.O. Municipal Corporation6 held that environmental pollution and polluting the atmosphere should also be regarded as amounting to violation of Article 21 of the Indian Constitution.

On the matter relating to Water Pollution, the Judiciary in some of the landmark judgments like in a writ petition M.C Mehta v/s Union of India8 giving historic judgment ordered the closure of polluting tanneries near Kanpur highlighting the pollution of the river Ganga by hazardous industries. In this judgment, it was observed that a tannery unable to setup a primary treatment plant cannot be permitted to continue to be in existence.

Air Pollution was also considering a serious aspect The Apex Court in Taj Trapezium Case 9 delivered its historic judgment in the circumstances where Taj Mahal and other historic monuments was facing threat due to high toxic emissions from Mathura Refineries, Iron Foundries, Glass and other chemical industries by giving various directions including banning the use of coal and cake and directing the industries to Compressed Natural Gas (CNG).

In later judgements, also the concerns of the Apex Court can be seen in terms of the environment pollution and the court in the case of - Vellore Citizens' Welfare Forum v. Union of India 10 held that 'Sustainable Development' as a balancing concept between ecology and development has been accepted as a part of customary international law.

Vellore case has been proved a turning point of the growth of environmental law in India as the Precautionary Principle and the Polluter Pays Principle have been accepted as part of the law of the land view a view that 'The Precautionary Principle' and 'The Polluter Pays Principle' are essential features of Sustainable Development.

Conclusions and Suggestions - In the light of the above discussions, it is quite clear that there is a major threat to the environment and the earth due to the pollution and hence the world community is also putting its efforts to reduce and mitigate the effects of global climate change and global warming. The various steps are taken by the international community through the continuous meetings and agreements since four decades; however the damage caused to the environment in the last century is now showing its adverse effects in the form of rising temperatures, increase in the sea shores, melting of glaciers and resulting into floods and temperature rise. Loss of forests is badly affecting the wild life and ecology. Water, air and soil pollution on the other hand is affecting badly the human life, aquatic life, all living creatures and mainly reducing the productivity of the soil due to which there is an apprehension of food scarcity in the near future.

However, given the long experience of human society, merely framing the laws will not be sufficient to reach the sought goal but cultivating the mind to that effect is also needed to bring the objective of the particular legislation into reality. Hence, there is still a long way to go to make mother earth free from pollution and have a healthy

atmosphere around us. The sense of responsibility among citizens towards our atmosphere along with the legislative enactments will definitely lead us to make mother earth more loveable and livable.

Note - The author recognizes the following legislative enactments, authors and editors whose work has been utilized in preparing this research paper.

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Lessons for Environment Protection from Indian Scriptures

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Abstract - Degradation and exploitation of environment have been a problem since times innumerable. Everyone is talking about environmental protection and reduction of environmental exploitation. Earth Summit and many such worldwide steps have been taken but at the same time there are many scriptures in India which talk about similar steps to be taken. Vedas make several reference to hydrological cycle, environmental protection and appeal to individuals to protect environment rather than exploiting it. These scriptures also mention solutions for such problems involved in the day-to-day activities in Hindu customs.

This paper explores the verses mentioned in Indian scriptures that appeal to individuals to protect the environment.
Key Words - Environment degradation; environment protection; pujyabhav drishtikon; vedas; Ramayan; yagna

Introduction - Citizens of India have been following Vedas for several centuries and the abundant knowledge contained in it. Vedas name 'shrushti' (environment) as an important aspect of life for human beings. The concept of 'shrushti' according to Vedas, accomodates both living as well as non-living things. Is development that we see today really a 'development'?

According to one of the theories mentioned in Upanishads, the universe is made up of five key elements- 1) Earth (Prithvi), 2) Water (Apah), 3) Air (Vayu), 4) Light & 5) Ether (Akash). There is a delicate balance maintained by nature among these. Any kind of imbalance between these would give rise to problems for human beings and other living organisms on earth.

Today's development is more of Bhautik Sukh and is related to 'Vishay' - position, status, money, food or person. One remains happy when these are achieved; is unhappy when one does not achieve these. According to Vedas, the perception towards life influences development. If one wants to find out the cause of environment degradation, one needs to see how 'shrushti' has been seen over a period of time. The Vedas talk of a continuous 'sangharsh'(tussle) between 'shrushti' and 'manav'. But this 'sangharsh' needs to be 'Sahyogatmak sangharsh' meaning a conflict between a mother and a child where they may have a conflict with each other but at the same time they support each other when required. This kind of 'sangarsh' can be achieved when one is able to understand the perception of an individual towards nature.

Drishtikon - There are 3 types of Drishtikon (perspectives) - Bhogwadi , where a human being looks at nature as an object of exploitation. For example, the moment a business man goes to Himalayas and sees that the water in the stream is so clear and refreshing, he will get a business idea of using this water as packaged drinking water to be sold at a high price. Kavyatmak Drishtikon is one like Wordsworth who wrote poems appreciating nature such as on Daffodil flowers and a Rainbow. Kalidas in his Shakuntalam had similar drishtikon. One looks at nature and appreciates it. The third is Pujyatmak Drishtikon, where one looks at environment as a pious entity. In Hinduism, every tree has a link with specific celebration and that gives importance to that tree. Or 'Gau' (Cow) is called as 'Gaumata' or 'Ganga' as 'Gangamata'.

Vedas recommend one should have Pujyatmak Drishtikon towards environment as that would help the world to survive. The modern equipments may be used but that should not degrade environment so much that it has a permanent scar on the 'shrushti'. If this Pujyatmak Drishtikon is not present when development takes place, then it is not holistic; it would only be exploitation.

Yagna - In Yajurveda, there is a mention of a concept 'Yagna'. 'Yagna' is sacrifice. Sacrifice can be of material (dravya), Deity (dev) and giving (dana). In Purushsuktam it is said 'every creation is like yagna'. All elements of nature are interconnected and affect each other. The sunrays heat water in the sea and form clouds, clouds get caught up in trees on mountains and give rains; rain falls on earth and mixes with river which ultimately meets the sea. Rains from clouds grow plants and plants support life on the earth. So basically, human living on this earth needs to be 'krutagna' (thankful) and sensitive towards environmental issues. Whereas, the development that is taken up by human beings is of 'krutaghnata' (thanklessness). Thus, human beings are thankless to the treasures that 'shrushti' has to offer to him.

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The concept of yagna can be a precursor to showing 'krutagnata' (thankfulness) to the environment. The materials used in 'yagna', in right quantity, and the smoke from the 'yagna' cleanses the environment. It helps in maintaining the essential constituents of the environment. The performance of 'yagna' may help in controlling pollution.

Divinity of Environment - Vedas recognize the divinity in nature. There are different hymns to praise the deities. These hymns are basically prayers for natural elements and to celebrate the divine being into these elements of shrushti. For example, there are hymns for glorifying the Sun or sun as the protector against darkness. On the whole, it is to respect the solar energy that the earth receives in abundance. Hymns are there to admire Vayu which is to appreciate the wind power. Thus, the Vedic hymns were much more advanced in valuing environment and protecting it.

Bhoo Suktam of Rigveda is a group of hymns to appreciate and to apologise to Mother Earth for the way human beings have used it. In Oshadhi Suktam of Rigveda, plants and vegetables are treated as mother. Atharvaveda, mentions certain names of Oshadhis with their values. This is an important source of information for Ayurveda. A hymn in Rigveda, teaches to ensure that human beings should not fell trees but plant them. Also, a verse in Veda mentions that if one needs to enjoy happiness for thousands and hundreds of years, then one must take up systematic planting of trees.

The Varah purana tells various plants to be planted to avoid going to hell. This is precisely to emphasize the importance of plants and trees in the lives of an individual. Shri Krishna, in Bhagvad Gita, compares world with a large banyan tree. He further mentions that he, as The Lord, accepts leaf, flower, fruit or water whatever is offered to him. This speaks volumes about the importance of protecting plants and trees producing these offerings to the Lord.

In Mahabharata's Shantiparva, Bhishma is seen advising Yudhisthira, that trees that yield edible fruits must not be cut in his dominion.

Ravana, in Ramayan, is shown to have said, "I have never cut a fig tree in the month of Vaishakh then why am I facing this!". This precisely indicates the rules about cutting trees during those times. When Sita was abuducted by Ravana, Rama asked the trees and birds the whereabouts of Sita. Thus, appreciating the life in the trees and the birds. Also Sita is shown to be holding a 'darbha' (grass) in her hand to protect herself from Ravana. This depicts the importance given to 'darbha' in the nature settings. Scientifically, darbha (grass) is said to help to curb soil erosion. In fact, many stories in Ramayana, appreciate nature and conservation of nature as it comes to the aid of Lord Rama from time to time in different manner, be it Hanuman, Sugriva or the small squirrel or even Jatayu. Every element of nature comes to help Lord Rama; hence needs to be conserved as they may be helpful to human beings.

Conclusion - The customs in Hindu household are based on learning from Vedas, Puranas, Mahabharatha and Ramayana. Many customs are environmental friendly. It is only recently that the customs have created harm to environment. For example, Atharvaveda points to the importance of some medicinal plants, which would be useful for the treatment of various diseases. Plants like Tulsi are of prime importance in Hindu household. The courtyard of a Hindu home is incomplete without a Tulsi plant. This is holiest of all plants mentioned in the Hindu scriptures and not without reason, given its medicinal qualities.

A story in Vana Parva of Mahabharata, about Satyavan and Savitri talks about the extent to which a wife would go wishing a long life for her husband. On the 'Vat Savitri poornima' women in India perform pooja of the Banyan tree. Whatever the story and the vrat may talk about, it encourages plantation and conservation of trees like the Banyan tree which have a long life and growth.

Importantly, ecological harmony and the environmentally responsible behaviour would follow, if scriptures were put into practice. As the Vedic Prayer prays goes 'May all live happily. May all enjoy good health. May all see auspiciousness. May none experience distress. May peace prevail everywhere. All are to be happy, be healthy, see good, may all enjoy prosperity, may none suffer'.

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Maharashtra Nature Park, Mumbai : A Case Study for Solution to Climate Change Challenges

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Abstract - Global climate change has put before us the most challenging situation against mankind in the form of rising temperatures, rising sea levels, melting ice caps, drying flood plains, forest fires, loss of species and irregular rain pattern. The present study is about Maharashtra Nature Park (MNP) which is a 41 acres of land piece located along the banks of the Mithi River. Once a landfill site, a waste land adjoining the Dharavi slum was systematically changed into a rich forest around 1994 with introduced plant diversity by sheer commitment of nature lovers. It is not only a carbon sink that reduces and controls temperature, rebuilds soil and provides refuge for species but the park is home to 158 species of birds, 85 types of butterflies, 38 varieties of reptiles, 30 types of spiders, varieties snakes, and amphibians . Almost 300 varieties of plant species flourish here. It is an active all in one learning center for rainwater harvesting, vermicomposting, study of floral and faunal diversity and medicinal plants. This study also highlights the contributions of prominent personalities like Lt. Dr. Salim Ali, common people and NGOs like WWF and many others who took ownership of this park. Government intervention through MMRDA lead to setting up of Maharashtra Nature Park Society(MNPS) which strived hard to save this urban forest from the clutches of land grabbing initiatives. This success story should be a role model that needs to be replicated to achieve the goal of sustainable development.
Key Words - MNP, MNPS, Dharavi, biodiversity, MMRDA, Mithi River.

Introduction - History and Introduction - Set up as a conservation initiative, Maharashtra Nature Park located on Bandra Sion Link Road at Dharavi Mumbai is situated on the southern bank of the Mithi River (Latitude 19° 02'N; Longitude 72° 48'E). Here the Mithi River is influenced by the tidal actions and therefore has a thriving mangrove forest around it. This Mithi River creek is often referred to as Mahim Creek, as the fall of the river into the Arabian Sea happens at the Mahim Village. This littoral or swamp forests of estuarine ecosystem existed several years back, which was probably cut and taken away or simply buried or dumped under the debris of city garbage. This landfilling process also attracted scavenging for recyclables especially metal pieces or may be paper waste etc. Dharavi slums in later days developed the miniscule recycling entity just because this city landfill site existed here. In India, a landfilling is also referred as a dumping ground.

The land on which the Maharashtra Nature Park stands today was used as a dumping ground probably for more than 20 odd years. Though no official data is available to support this claim, the depth of the garbage filling (which is more than 8.5 meters) is proof.

The land being part of the then old settlements (Village Parighkhadi) was included when the government decided to develop the Bandra Kurla Complex (BKC, which stand there today). Being part of the same village, this piece of land (which measure 37 acres / 15 HA today) automatically became part of the BKC Plan. But a problem arose as there existed the flow of Mithi River which separates this land from the other lands of the Parighkhadi and therefore because of lack of normal connectivity, though this land was part of BKC, and was being used as a landfill site, it was separately developed as a Nature Park.

It was the brainchild of the famous ornithologist, Lt. Dr Salim Ali that this area got developed as a Nature Park. In fact, it was Lt. Dr Salim Ali who in the month of September 1984 planted first five saplings here namely Banyan (*Ficusbenghalensis*), Peepal (*Ficusreligiosa*) Umbar (*Ficusglomerata*), Mango (*Mangiferaindica*) and Flame of the Forest or Palash (*Buteamonosperma*). This handsome activity was quickly picked up by students who helped rehabilitation of this stinking landfill site by planting several hundreds of tree saplings. One day while passing through the Bandra-Kurla junction, Shanta Chatterji, a corporate lawyer and chairman of WWF (Maharashtra and Goa) was struck by the different varieties of birds that flocked the creek. The awesome sight of those migratory birds caught her fascination. On further inquiry she realized that the area was host to 55 species of birds. This propelled her to speak to the government and get the area earmarked as a bird sanctuary. Luckily, the blueprint of her plan was passed by the Bombay Municipal Corporation (BMC), which entrusted her with land for the project. Shanta Chatterji with the then WWF education officer Himanshu Joshi conceptualized the

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park as a green refuge that also served an educational purpose. As a citizen she is very much concerned about environment conservation, which is deteriorating and needs immediate action.

World Wildlife Fund for Nature - India (WWF-India) was instrumental in preparing the design and the layout of what it exists today. Volunteers of WWF, put in their sweat and toil to bring this glory to the park. By nurturing those thousands of trees with care giving thorough watering, careful soil-working, manuring and tending; all the trees were brought to bloom. Rare trees, plants of medicinal importance, several species of palms, etc were added step by step. So also other infrastructure was created like Education Centre Building, compound walls, water tanks, underground pipelines, pathways, etc. Architect Ulhas Rane planned its layout. Amazingly, absolutely no artificial fertilizers or chemicals were used in the transformation. Instead, vermiculture programs and rainwater harvesting were made the mainstay of the park. After years of tireless efforts, the park was opened for school children in 1992. Environmentalist Mhaskar, who has been with this project since its conceptualization, feels that the park has been a boon to school children. "Initially it was planned for school kids but later on they realized that all this needed finances for setting up additional facilities like an amphitheatre, library, etc. It was decided to open the park to other visitors too. Sale of ayurvedic plants grown in the park also added to finances. Close to 1, 50,000 mangrove saplings were planted on the periphery of the park along the creek. Today, it supports a lush evergreen mangrove forest.

The team also ensured that most of the trees planted are of Indian varieties and that exotic, water-intensive varieties are avoided. Additionally, a section of the park has been earmarked for medicinal plants and horticulture. To irrigate the vast vegetation in the park, a rooftop rainwater harvesting system has been built, which stores around 2,000 kilo litres of water every monsoon. The water collected is stored in an open pond, which is home to several aquatic plants and provides a backdrop for the park's Rain Education Centre.

The Park which was otherwise known as Mahim Nature Park until now was rechristened as Maharashtra Nature Park with its inauguration which took place on the Earth Day (22nd April) in 1994. For the development and management of the Park, Mumbai Metropolitan Region Development Authority (MMRDA) has promoted a society, known as Maharashtra Nature Park society. This society is responsible for day-to-day management and activities of the Park.

The Society has an apex body of Board of Governors of which the Chief Secretary to the Government of Maharashtra is the President and the Co-President is Shri Bittu Sahgal. It has a representation of several top government officials as well as some eminent personalities from the field of Environment. Thus, the Government is working hand in hand with the scientific community.

The Park's unbelievable biodiversity - Said to be the Green Lung of Mumbai, the Maharashtra Nature Park provides everyone a very pleasant escape from the pollution-ridden life of the city. Being fine abode to several species of flora and fauna, the park is visited mostly by nature lovers. As you enter the threshold of the park, you begin wondering how so much greenery can originate close to the place which is the biggest slum of Asia. Moreover, the rich greenery of the nature park maintains proudly to boast of its species of trees. The mangrove evergreen forest causes plenty of species of birds, butterflies, insects and fungi to thrive in the park. Beyond counting approximately 350 species of trees, the park has 72 species of butterflies (Gokarnakar, 2008) and 80 species of birds. Between October and March, the park becomes a favourite spot for bird watchers, as one can see thousands of birds hovering over the Mithi River and in the park. A classic example of vision and the eye opening results started making news and locals were really astonished with the results and transformation of this location getting converted to a beautiful nature park right in the midst of Dharavi slums.

A transformation of garbage dump to a green forest land, Mahim Nature Park has beautiful woodland with about 18 thousand trees, 350 varieties of plants with few specialty herbs, a small lake, 100 of varieties of migratory birds coming, insects, beautiful butterflies, reptiles and few mammals and about a lakh fish.

Some of the trees identified inside are Teak, Golden Apple trees, Lasora, Bottle brusk oak, Flame of the forest, Devil's tree, Kadamba, Soccer ball, Red Silk Cotton Tree, Ashoka, Ballon Pant and Ficus Benjamin, and many more.

The lake inside Mahim Nature Park attracts species of water birds and reptiles too, major species of reptiles that can be seen here is Russell's viper, rat snake, cobra and heard sometimes back the green vine snake along the lake corners are quite natural since there are varieties of frogs and insects like chameleon, house gecko and garden lizards too. Majority of the species belong to 31 percent of terrestrial habitat followed by 29 percent of rock crevices, 23 percent of arboreal and 18 percent of aquatic habitat **(Walmiki et al, 2012)**.

Water birds like greater spotted eagle, ring necked parakeets, asian Pied Starling, Yellow Crowned Mahratta Woodpeckers and Barn owl are some of which can be seen in the nature park.

Enjoy about 72 species of butterflies like Commander, Black Rajah, Blue Tiger, Blue Oak leaf, Lime Butterfly, White Orange tip, Common Rose, Psyche, The Pioneer and Baronet **(Gokarnakar, 2008)**.

Mammals like fruit bats, mongooses and quick running striped squirrels are among some of those mammals found near the lake area of this park.

Future of the park - It was around 2015, the revamp plans of Maharashtra Nature Park were in news. Considering the

actual purpose of the park, 'to bring people near to nature' and benefits to eco system, experts from various fields like ecosystem, Oceanography, Fisheries and Botany have been asked to work new revamp plan and if executed successfully, new sections for fruits, trees and palms, an education center, a nursery, a separate wooden area and a section for medicinal plants with a bird observation point at another place will be few of the new attractions inside Mahim Nature Park.

With this revamp, plans of setting up a 'Mangrove Research and Training Centre' are also in place. Till date, NGOs and active school and college students have already shown interest by planting thousands of saplings inside. Soon the center will have all required facilities like information on coastal and marine life via books, special area dedicated to study, training and knowhow about mangrove nursery with experts' support from inside this nature park.

As the debate continues on whether Aarey Milk Colony, Goregaon, is actually a forest or not, a government resolution (GR) from 1991 has revealed that Maharashtra Nature Park (MNP), popularly known as Mahim Nature Park, was notified as a forest back then. For this exercise, the site was addressed on to three issues:

Materials and Methods - Information was collected through historical survey from 1976 onwards and by interviewing various environmentalist and MMRDA officials. Also information was sought from available literature in the form of books and publications which were made available to me in the library section of MNPS office. Some information was obtained from internet sources.

Educational activities in MNP - Popular with picnickers, nature enthusiasts and amateur photographers, the park also hosts nature trails and farmers' markets on Sundays. Every year, around 1.5 lakh people visit this park. Blanketed by a verdant cover of vegetation, the park seems less noisy and cooler than the busy streets outside. A place has been earmarked for bird watchers near the creek from where they can observe the rich avian biodiversity of the park. One can also take a leisurely stroll on 'Shanti Path', a canopied walkway that winds its way through the entire length of the park.

When people come today to the Mahim Nature Park (MNP) they find it difficult to believe that, the forest they see before their very eyes was once a city garbage dump. But that is exactly what it was less than 20 years ago. This mini-forest is nothing short of a miracle. Apart from being a vital green lung for pollution-ridden Mumbai, the MNP also offers Mumbai's citizenry a welcome change from the din and hustle of city life. Studies carried out in the field of environmental education have confirmed the fact that students, tend to learn better and comprehend a situation, when taught with a practical approach. This is possibly why environmental education techniques work best outdoors or outside the classroom.

The survey based study observes that 84.1 percent subjects knew the location of MNP. On being asked, if the location of MNP is ideal; 80.4 percent agree. However, only 64 percent have actually visited the park. This brings to light the fact that there should be more centers like MNP around Mumbai, that are accessible to all people, so as to help increase public's interest about the environment. When asked the purpose of them visiting MNP, the answers of 57 percent of the participants was related to academics. 19.3 percent found themselves to be more interested in nature after visiting MNP. 19.3 percent found themselves to be more aware about issues related to the environment. 16.7 percent realized the importance of the environment and were more sensitive towards it. 22.9 percent felt a change in their behavioral habit or some other personal change Devayani Singh (2013).

Today experts from around the world visit the MNP to study how so many trees could grow on a dumping ground used for decades by the Municipal Corporation of Mumbai.

On the periphery of the Park is, the Mahim Creek, which supports a lush evergreen mangrove forest. This estuarine vegetation and the surrounding mud flats are favorite roosting spots for migratory and aquatic birds that winter in the Indian subcontinent. Which is why the MNP has become a particularly popular spot for birdwatchers from mid-October all the way to February-March. Though the waters of the Mithi River are much polluted, the MNP and the surrounding mangroves provide resting spots for thousands of birds.

Presently Maharashtra Nature Park has the following sections :

1) Education Centre, 2) Nursery, 3) Wooded Area Section, 4) Medicinal Plants cultivation Section, 5) Palm Section, 6) Fruit Tree Section, 7) Vegetable Section, 8) Aquarium, 9) Bird Observation Point and 10) Vermicomposting demonstration Project.

The Maharashtra Nature Park has the following facilities for conducting the educational activities -

a) Audio-Visual hall, b) Exhibition hall, c) Activity spaces for conducting various activities like nature games, drawing or painting competitions, etc., d) Open air Amphitheatre, e) library of more than 500 books on nature and environment related topics, f) Nursery for growing and sale of plants.

Maharashtra Nature Park conducts the following activities: (i) Nature Trail, (ii) Nature Games, (iii) Study of Medicinal Plants, (iv) Bird Watching, (v) Seminars/Workshops/ Lectures, (vi) Drawing and Essay competitions and (vii) Support to research.

Some success stories in other parts of the world - Following are the success stories which have set examples to be replicated 1) Cesar Chavez Park in Berkeley, California. 2) Known as the largest landfill in the Middle East, Hiriya has been transformed into a green park dedicated to recycling and conservation. Hiriya is part of one of the largest environmental rehabilitation projects in the world. 3) Formerly known as Mucking Marshes Landfill, the Thurrock Thameside Nature Park is now a growing

green area that is expected to reach 845 acres. The transformation was spearheaded by well-known naturalist Sir David Attenborough and members of the Essex Wildlife Trust, who have converted the former dump into a bird watching paradise filled with footpaths and cycling lanes. 4) Mount Trashmore Park was once one of the largest landfills in the US is now a beautiful park. 5) Chambers gully, Australia was local landfill's transformation was reclaimed and naturalized almost completely by volunteers – not government officials. The hard grassroots work has paid off, and Chambers Gully is now a wildlife haven that is home to scores of koala bears. 6) In our own country in India, a village in Vengurla (Konkan region) which supports a population of 12,000 had a landfill of unsorted rotting garbage. On the 6.5 acre municipal site where piles of trash lay until a year ago, a green patch functions as orchard, farm and garden. Banana, coconut, cashew and mango trees thrive; marigold, rose and tulsi have been planted. 7) Ten years ago, the City and Industrial Development Corporation (CIDCO) found that the plot in Sector 9, CBD Belapur, India was often encroached upon. The plot was handed over to CBD Residents' Agro Society, a voluntary, not-for-profit association, to develop it as a green zone. A group of environmentally-conscious residents have transformed a two-acre plot land used as a dumping ground in Belapur into an agro garden.

Conclusion and future action - No other city in the world had such a unique concept to convert an abused land which was used as a landfill to convert it into vibrant manmade woodland before the Maharashtra Nature park came into existence. Nature too has responded to the efforts put in by people by supporting the life thriving here again.

Mumbai needs more centers like MNP. A few suggestions while setting up such centers would be to keep in mind that MNP is much more than just a garden. It is a result of natural selection over a period of many years. The trees planted should be those which can survive harsh conditions and help rejuvenate the land. Most trees in MNP exist as a result of natural propagation by insects, birds and mammals. The main idea for setting up a similar center in future should not be beautification but to create a natural habitat within the city. Parks like MNP have the potential of changing the way people think about climate change challenge.

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Reflection of Waste Segregation Policy on Citizens at Household Level : A Case Study

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Abstract - With rapid social and economic development in India, all big cities are facing the problem of increasing amount of waste. This not only puts pressure on the existing waste management methods but also affects the health and well-being of citizens in negative ways. As a result, the municipal boards of each city have come up with several mandatory waste management policies. One such policy is segregation of waste into wet waste and dry waste at the source i.e. at household level. Even though the attempt is commendable and was long-awaited, it has been received negatively by most of the citizens. With the convenience of dumping all the waste together being taken away, citizens are further clueless and non-enthusiastic about segregation. This paper focuses on the physical and technological barriers among the citizens towards segregation of waste. The conclusion will be based on a case study performed through a questionnaire survey in the area of Navi Mumbai, the twin city of Mumbai. The objective of this study is to analyze the effects of the waste segregation policy and compare them with citizens' attitudes and inclination. The paper will also suggest motivational means to encourage the citizens in order to achieve the goal of a clean city.
Key Words - Waste segregation, wet waste, dry waste, physical barriers and technological barriers.

Introduction - Any object when eliminated or discarded as no longer useful or required after completion of a process, is called as 'waste'. Waste can be classified into various categories depending upon its source and ability to degrade. Thus, there is industrial waste, commercial waste, municipal domestic (solid) waste, e-waste, biomedical waste etc. which can be further sub-divided into biodegradable, non-biodegradable or recyclable. Some of these wastes are evidently harmful to not only the environment but also human health. e.g. biomedical waste. On the other hand, wastes like municipal solid waste, have lesser potential to cause direct harm to human health but can prove to be a big nuisance to environment, if not managed well.

Until recently, domestic waste was being collected in one common dustbin at household level. Most of this waste consists of leftover food and kitchen waste along with large amount of plastic that comes from packaging and disposable cutlery. It also contains paper, sanitary napkins and baby diapers. This waste is usually collected by garbage collectors from domestic premises to further dump into the garbage collection van. This collective dumping complicates the process of segregation and management of waste. It has been observed that almost 80 percent of domestic waste can be recycled and the rest can be converted into compost. Considering the residential expanse of the major cities, it is easy to imagine the total amount of waste generating each day from each city. These characteristics of domestic waste lead to realize the importance of waste segregation in cities. It also raises curiosity to assess the level of awareness among the citizens, who generate the waste, with respect to their contribution towards management of waste.

For convenience of this research paper, the city of Navi Mumbai is taken into consideration to conduct survey to assess the level of awareness among the citizens in the wake of recently implemented waste segregation policy by Navi Mumbai Municipal Corporation (NMMC). The city has been ranked 12th among 73 cities surveyed for cleanliness and hygiene by the Union Ministry of Urban Development (MoUD) and Quality Council of India (QCI) as a part of Swachh Bharat Abhiyan. To make the policy effective, NMMC has also come up with reprimanding actions e.g. not collecting the waste if it is not segregated. Thus, it becomes important to know the attitude of citizens of Navi Mumbai towards the waste segregation policy.

Objectives

- To understand the awareness level among citizens about waste segregation policy implemented by NMMC
- To assess the attitude and inclination of citizens towards segregation of waste at household level
- To check the promotional measures taken by NMMC
- To evaluate the limitations towards the segregation policy
- To suggest recommendations for promoting the segregation of waste

Research Methodology - The city of Navi Mumbai was

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chosen to conduct a survey. A total of 50 participants were randomly selected. A questionnaire was prepared as part of the primary data collection. It contained questions related to actual measures taken by citizens for waste segregation. It also contained opinion based questions regarding limitations of the policy and challenges faced by citizens while performing segregation.

The secondary data was derived from -

i. Reference books
ii. Newspapers
iii. Internet websites
iv. Published and unpublished thesis

Observations -

Table no. 1 (See in the next page)

Some peculiar observations are as follows - Despite the mandatory nature of segregation policy, almost 30 percent of participants did not segregate waste and also did not consider segregation to be necessary.

- Remaining almost 70 percent of citizens carried out segregation of waste.
- Still, almost 66 percent of the participants found waste segregation to be inconvenient.
- Almost 20 percent of participants were of the view that NMMC did not have proper infrastructure and plan of action to deal with waste even after segregation. Although, all the participants credit the NMMC for collecting the wet waste and dry waste separately.
- Only one participant practiced composting of organic waste at household level.

Conclusion

The research paper can be concluded by mentioning that -

- The mandatory nature of segregation policy has made a positive impact on the citizens.
- The degree of awareness towards waste segregation varies depending upon educational qualifications, income category as well as gender.
- Contrary to common belief, the high income groups and subsequently the higher educated groups are found to be apathetic towards waste segregation policy.
- The lower income group was observed not practicing segregation mainly because of lack of infrastructure present in their locality and not because of apathy.
- Middle income group was observed to be highly sensitized towards waste segregation policy.
- There is more awareness among women as compared to men.
- Awareness about segregation has not led to promotion of recycling of waste, considering the fact that a significant number of citizens do not consider composting as a method of recycling.

It can be indicated that NMMC has to put in efforts to improvise the infrastructure to make the policy more effective.

Recommendations

- NMMC can spread awareness through workshops, public awareness campaigns etc.
- Along with reprimanding action for defaulters, NMMC can also give incentives e.g. tax exemption, to housing societies which perform well.
- Educational facilities such as schools and colleges can be targeted to spread awareness through students.
- Waste collection method should be made easier and convenient for citizens to motivate them. This includes maintaining two separate dustbins in each housing society for collection of waste. This is highly recommended for lower income group localities, where lack of infrastructure is the main cause of lack of segregation.
- Encouraging more number of citizens to carry out composting at household level by arranging free seminars and workshops to train them for the same. NMMC can collaborate with NGO's for this purpose.

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Table no. 1

Parameter	**Participants**											
	Males Total 14						Females Total 36					
Income group	HIG		MIG		LIG		HIG		MIG		LIG	
Number of participants	1		13		-		3		28		5	
Response to survey questions	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Participants who are aware about segregation policy	1	-	13	-	-	-	3	-	28	-	5	-
Participants who carry out segregation -	1	1	12	-	-	1	2	22	6	-	5	
Participants from whose society waste is collected in two separate compartments	1	-	13	-	-	-	3	-	28	-	-	5
Participants who find segregation inconvenient	1	-	10	3	-	-	3	-	14	14	5	-
Participants who carry out composting -	1	-	13	-	-	-	3	1	27	-	5	

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Biosorption : A Solution to Laboratory Generated Heavy Metal Waste

Rochelle Ferns*

Abstract - Experiments in the laboratory form an integral and compulsory part of college science education in India. In chemistry, many of these experiments involve the use of heavy metal ions like Cu(II), Cr(VI), Ni(II), Cd(II), Hg(II), Zn(II) etc. Most colleges have a large number of students that work in different batches in the chemistry laboratory, thus generating a large amount of chemical waste. However, most of the college laboratories do not have proper waste disposal systems, since it is difficult for colleges to invest in expensive techniques for waste disposal. Often chemicals, both used and unused, are disposed into the laboratory sink where they enter the municipal drainage system which is finally emptied into the sea. With authorities focusing on safe disposal of waste from industries, the disposal of waste from the laboratories of educational institutions goes unnoticed and unmonitored. Biosorption has shown promising results for the removal of heavy metals from water. This study involves the use of agricultural waste for the removal of Cr(VI) from solution, thus serving as a low cost method for the treatment of heavy metal waste from laboratories.

Key Words - heavy metals, biosorption, biosorbent.

Introduction - Compounds and salts composed of heavy metals are widely used for experimental work at the undergraduate, post graduate and also junior college level in the chemistry laboratory. For example in Qualitative Semi Micro Analysis, salts of Ni(II), Pb(II), Zn(II), Cu(II), Cd(II) are used. Complexes containing Hg(II), Cu(II), Fe(III), Ni(II) are prepared and analysed as part of inorganic chemistry experiments. Compounds of Zn(II), Fe(II), Fe(III) and Cr(VI) are used to prepare standard solutions in physical, analytical and inorganic chemistry.[1] Even though the study of Green chemistry is integrated into most levels of learning, the general practice amongst students in most colleges is to discard the chemicals directly into the sink. Mumbai alone has around 50 colleges with each college having student strength of between 200 and 1500. Thus a large amount of heavy metal waste is introduced into the municipal drainage system.

High concentrations of heavy metals in water can be extremely toxic, both to marine as well as human life. For example, As(III) interferes in some biochemical processes like the generation of ATP since it is chemically similar to P. At high concentration, compounds also coagulate proteins. Cadmium when ingested in excess replaces Zn(II) in key enzymatic sites causing metabolic disorders. At high concentrations, Cd(II) can cause kidney problems and bone marrow disorders. The major biochemical effect of Pb(II) is its interference with heme synthesis whereas Hg2+ causes enzyme inhibition, cellular dysfunction, neurological disorders, behavioral problems etc. Exposure to an overdose of Ni(II) leads to headache, giddiness, vomiting, convulsions etc. Nickel is also carcinogenic in nature. Cr(VI) is considered to be a group A human carcinogen because of its mutagenic and carcinogenic properties.[2,3] Absorption of excess Cu(II) leads to Wilson's disease in which excess copper is deposited in the brain, skin, liver, pancreas and myocardium. Long term effects of Cu(II) exposure include damage to the liver and kidneys. [4]

The techniques that could be adopted by colleges for the treatment of heavy metal waste could be ion exchange, reverse osmosis or solvent extraction.[3] However these techniques are expensive and could generate other toxic sludge or waste that would require disposal. Biosorption being an inexpensive, ecofriendly and efficient technique could serve as an alternative. Biosorption involves the use of biological material for the removal of metal ions from solution. Biosorption is a subcategory of adsorption, where the sorbent is a biological matrix. Biosorption is a process involving rapid and reversible binding of ions from aqueous solutions onto functional groups that are present on the surface of biomass.[1] Various biosorbent materials like walnut skin, coconut fibre,[5] defatted rice bran, rice hulls, cotton seed hulls[6] have been tried for the removal of heavy metal ions from solution and have shown promising results. Agricultural products waste like rice hulls, cotton seed hulls, coconut husk are a good option for the treatment of laboratory generated heavy metal waste due to low cost.

Areca nut husk as a biosorbent - Since Cr(VI) is widely used in the form of $K_2Cr_2O_7$ in different experiments across

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all classes studying chemistry, a method using Areca nut husk for the removal of Cr(VI) from laboratory generated waste has been developed. Areca nut commonly known as betel or supari is the fruit of the areca nut palm (*Areca catechu L.*). India is the largest producer of areca nut in the world with the crop being cultivated on a large scale in Karnataka, Assam, Kerala, Tamil Nadu, West Bengal, Meghalaya and Maharashtra. The nut is enclosed in a husk that comprises 60-80 percent of the total weight of the fresh nut. The husk can be used for making hard boards, cushions and brown wrapping paper. Most of the time the husk is simply discarded. Because of its ample availability, both in and around the Mumbai city, the areca nut husk was chosen as the biosorbent material for the removal of Cr(VI).

Materials and method - The procedure for the removal of Cr(VI) from aqueous solutions using areca nut husk as a biosorbent material was first standardized using the following procedure.

The areca nut husk obtained from the Virar region in Palghar district near Mumbai was first washed thoroughly with water and boiled to remove dirt and other soluble material. The washed and boiled husk was then completely dried in an oven at 120°C for 24 hours. The husk was cut into fine size and stored in a desiccator. An aqueous stock solution (500mg/l) of Cr(VI) ions was prepared using $K_2Cr_2O_7$. Fresh dilutions were prepared for each experiment. 0.1N HCl or 0.1N NaOH was used to adjust the pH of the solutions.

For each experiment, 100ml of Cr(VI) solution of known concentration and pH was brought in contact with a known amount of husk. The samples were agitated at a speed of 120rpm in a rotatory shaker, to facilitate proper contact between the metal ions in solution and the binding sites in the husk matrix After a specific time, the solution was filtered and the residual Cr(VI) in solution was determined spectrophotometrically using 1,5 –diphenylcarbazide.[1]

The efficiency of Areca nut husk for the removal of Cr(VI) ions was investigated by studying the following parameters -

1. Effect of pH
2. Effect of contact time
3. Effect of concentration of Cr(VI)

Results and discussion -

Effect of pH of Cr(VI) solution - Chromium exhibits different types of pH dependent equilibria in aqueous solutions. In the pH range 2 to 6, CrO_4^{2-} and $Cr_2O_7^{2-}$ ions are in equilibrium, whereas at lower pH of 2 , $Cr_3O_{10}^{2-}$ and $Cr_4O_{13}^{2-}$ species are dominant.

The maximum biosorption of Cr(VI) on areca nut husk was observed at pH 2. **(See in the last page)**

As seen in figure 1, 75 percent of Cr(VI) was adsorbed from a 10 ppm solution of Cr(VI) ions by 10g/l of areca nut husk biomass at pH 2, whereas the percentage adsorption decreased by 68 percent as the pH shifted from 2 to 4. This indicates that at pH 2, the more dominant species of Cr ions viz. $Cr_3O_{10}^{2-}$ and $Cr_4O_{13}^{2-}$ that exist in solution, interact with the matrix of the areca nut husk, leading to biosorption.[7]

Effect of contact time - The kinetic profile of the biosorption of Cr is shown in figure 2.

At 60min, 53 percent of Cr adsorption was observed. As time increased, the percentage adsorption of Cr also increased, thereafter becoming constant. The system attained equilibrium at 240 min. Thus the contact time was maintained at 240 min for the rest of the experiments.**(See in the last page)**

Effect of concentration of Cr(VI) - s The rate of biosorption is a function of the initial concentration of ions. As the concentration of Cr ions was increased from 10ppm to 20ppm, the percentage adsorption decreased by 40 percent. For 30, 40 and 50 ppm solutions the percentage concentration remained constant at 12.5 percent. This indicated that at low concentration, the probability of the number of metal ions interacting with the matrix of the husk is maximum, thereby facilitating greater adsorption.[7]

Cr adsorbed (percent)

Conclusion - Biosorption experiments carried out indicate that Areca nut husk was capable of 75 percent removal of Cr(VI) ions from low concentration solutions. Solutions of Cr(VI) used in regular chemistry practicals in the laboratory were treated in the similar way and showed similar results. Since Areca nut husk is an easily available agricultural by-product with negligible cost, biosorption using Areca nut husk could be one of the solutions for treatment of solutions of heavy metal ions generated from college laboratories However, the biosorption process requires further investigation with respect to modeling, regeneration of biosorbent material/ discarding of used biomaterial and testing of the biomass with other heavy metal waste generated from the laboratory. Once completely standardized and investigated, filters made up of Areca nut husk could be prepared and used by college laboratories as part of their waste disposal system, thus helping in the reduction of heavy metal waste entering water.

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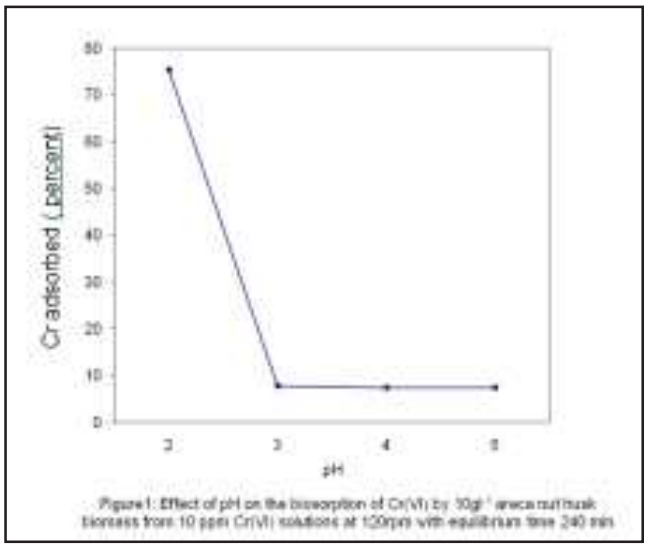

Figure1: Effect of pH on the biosorption of Cr(VI) by 10gl⁻¹ areca nut husk biomass from 10 ppm Cr(VI) solutions at 120rpm with equilibrium time 240 min

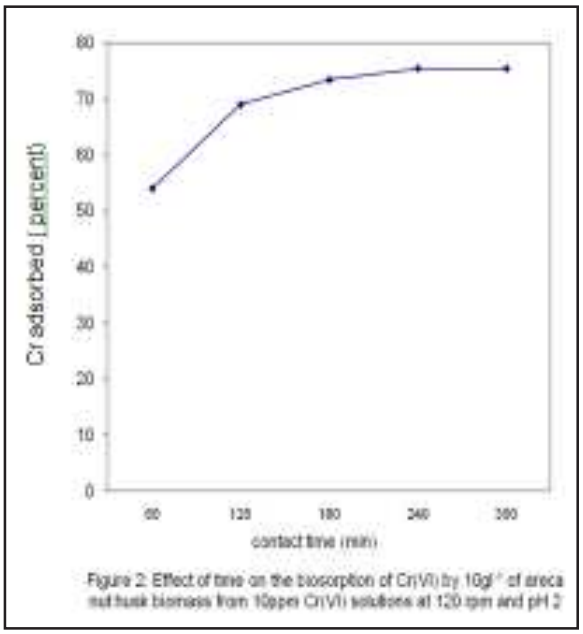

Figure 2: Effect of time on the biosorption of Cr(VI) by 10gl⁻¹ of areca nut husk biomass from 10ppm Cr(VI) solutions at 120 rpm and pH 2

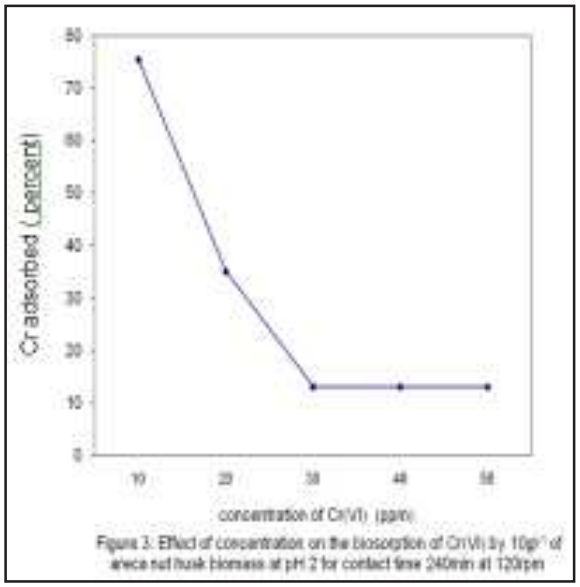

Figure 3: Effect of concentration on the biosorption of Cr(VI) by 10gl⁻¹ of areca nut husk biomass at pH 2 for contact time 240min at 120rpm

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E-Waste Management Rules : Need for Implementation and Awareness

Arti Pramod Gadre*

Abstract - E-waste and its adverse consequences disturb the living standards and environmental sustainability. Today's generation is the creator of e-waste and is facing the problem of its management. Studies show that it is an outcome of technological development achieved by the nation. E-waste is considered highly infectious for the environment and its components. It may create environmental risk for sustainable development. This paper seeks to throw light on what is e-waste, the benefits of recycling and e-waste management. Most people are ignorant about e-waste management, ill effects of e-waste on environment and health. E-waste (Management) Rules, 2016 has imposed fine on the producer who does not implement the rules. But producers are not fulfilling their responsibilities as given under these rules. This calls for more stringent rules which will have deterrent effect on the producers.
Key Words - E-waste, Sustainable Development, Recycling, E-waste (Management) Rules 2016

Introduction - In the era of information technology and modernization, people are coming close and connecting more as compared to the earlier days. This has been made possible with the discoveries in telecommuter and IT sector. This is leading to the development of all electrical and electronic equipments at a rapid pace with the invention of computers, mobiles, television sets, air conditioners, refrigerators, LED light, microprocessors etc. So, lives are becoming faster, easier, and relaxed. We are heading towards a better quality and higher standard of living. Here the question that arises is 'Are we making the world more sustainable?' and most importantly – 'Are we disturbing the environment?' 'Are we leaving the world a better and safer place for our future generations?' All these questions have arisen because today's biggest concern is environment protection and conservation. But this concern is still being ignored by the majority population of the world. And one of the most unspoken and not yet known fact to most of us, is the harm done by the e-waste, whose major reason is modernization and advancement globally.

This paper highlights the hazards of e-wastes, its ill effects on the environment and human health and the need for its suitable management in India. The current practices of e-waste management in India suffer from a number of drawbacks like the difficulty in invention of environment friendly techniques, unhealthy techniques of informal recycling, inadequate legislation and poor awareness.

What Is E-Waste? - E-waste Management Rule, 2016 defines e-waste as 'E-waste means electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumers as well as rejects from manufacturing, refurbishment and repair processes.' In other words, e-waste means old, dead electronic appliances such as computers, laptops, TVs, DVD players, mobile phones, etc., which have been disposed off by their original users.

E-waste can be categorized into three main sets, i.e.

- Large household appliances such as refrigerator, washing machine etc.
- IT and Telecommuter such as computers, monitor and laptop etc.
- Consumer equipment such as TV, mobile phones etc.

Each of these e-waste items contents components such as metal, motor/ compressor, plastic, insulation, glass, LCD, rubber, wiring/electrical, concrete, transformer, magnetron, textile, circuit board, fluorescent lamp, incandescent lamp, heating element, thermostat, brominated flamed retardant (BFR)-containing plastic, batteries, external electric cables, refractory ceramic fibers, radioactive substances and electrolyte capacitors.

Broadly, it consists of ferrous and non-ferrous metals, plastics, glass, wood and plywood, printed circuit boards, concrete and ceramics, rubber and other items. Iron and steel constitutes about 50 percent of the e-waste followed by plastic 21 percent, non-ferrous metals 13 percent and other constituents. Non-ferrous metals consist of metals like copper, aluminum and precious metals, e.g. silver, gold, platinum, palladium, etc. The presence of elements like lead, mercury, arsenic, cadmium, selenium and hexavalent chromium and flame retardants beyond threshold quantities in e-waste classifies them as hazardous waste.

E-Waste Components and Its Effect On Environment And Health (See in the last page)

E-Waste Treatment And Disposal Methods

1. Land Filling and Levelling - Land filling is a very simple and oldest way of disposal of waste. But it is little

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complicated and not at all useful to solve the problem of e-waste materials. In land filling process, a part of earth is dug, soil is removed from that part and decided amount of e-waste is put in to that dug area and then it is again covered up by soil to level it properly. To avoid contamination of e-waste with water sources a synthetic material is used to block it from all sides. E-waste is not biodegradable waste, so disposing it off takes many years.

2. Recycling - Recycling process can be conducted on the e-waste products such as computers, laptops, networking instruments, peripheral devices, telecommunication instruments etc. These products are separated into different pieces so that harmful substance or parts can be eliminated and remaining substances can be reused for future manufacturing process. It contains harmful substances or materials like mercury, cadmium, and helium as well as precious metals like gold, silver, copper, and lead in small amounts which have good commercial value and can be either reused or sold.

3. Reuse - Reuse means use existing products without replacing it by a new one. The problem of e-waste has become major because of the attitude of people around the world of buying new and discarding old one in a short span of time. Parties can exchange products among themselves in the market place like OLX, Pepperfry etc. where old products are sold or exchanged. Computers, mobiles and other programming devices need to upgrade their capacities so that majority of the junk can have a long life span. It reduce the problem of e-waste and also in a very economical way. This is the best possible way to reduce e-waste and its hazards and promote sustainable development.

4. Refurbishing - In recycling products are separated and useful substances are taken out of it. In reuse, existing product's life is extended. But in refurbishing, the existing product is modified and sold as a second hand product at a cheaper price. For refurbishing, the product has to be sold or exchanged with the original manufacture.

Government's Measures to Control E-Waste Hazard - To tackle with the problem of e-waste, the Government is taking several steps. One of that is to pass laws and rules to control generation of e-waste and to manage the e-waste which has been generated by the people.

1. E-waste (Management and Handling) Rules 2011 - The Indian Government had passed E-waste Management and Handling Rules, 2011. Under this rule, the manufacturer is held responsible for the disposal of e-waste products. These rules are as per the international standards. These rules have come into force from 1st May, 2012. But there is no provision of punishment or fine for non-compliance of rules by the manufacturer.

2. E-waste Management Rules, 2016

- The government has passed E-waste Management Rules, 2016 with the objective to enable the recovery and/or reuse of useful material from Waste Electrical and Electronic Equipment (WEEE), thereby reducing the hazardous wastes destined for disposal and to ensure environmentally sound management of all types of WEEE.
- These rules have come into force from 1st October, 2016.
- These rules impose liability on manufacturer, producer and consumer to dispose, store, collect, refurbish, recycle etc.
- Extended Producer Responsibility (EPR) is the new provision has been added, which has given long term responsibility on the producer to tackle e-waste products.
- Even authorised Recycling and Refurbishing Centres have been established under the rules.
- Punishment has been imposed on the manufacturers and producers who fail to comply with the given rules.

Analysis of Data Collected - The Researcher has done research by using non-doctrinal techniques. Questions were asked to group of 100 people from different backgrounds to find out the awareness about e-waste and its management techniques.

Figure 1

The basic question asked by the researcher was whether the person is aware about the term e-waste. 67 people out of 100 were aware about e-waste and the remaining 33 were ignorant about it. This has serious consequences as they create more waste and have no concern towards sustainable growth.

Figure 2

Even though there is awareness about the term e-waste, people do not know how to dispose it. Most people have sold it off to the scrap dealer, which is the most harmful way to dispose it off. Most of the scrap dealers smash the equipment, take the valuable substances out and either burn it or throw away the remaining part. This is harmful to the environment.

Figure 3

People are aware about e-waste and about its harmfulness to the environment. But they are not aware of its management techniques. There is ignorance among people as well as no interest in finding out the ways or techniques which are sound for e-waste disposal purpose. People think about only their homes and forget about the Indian philosophy about 'Vasudhaiv Kutumbakam' which means whole world is our home and we have to take good care of it.

Conclusion - The researcher has arrived at the following conclusions

- E-waste management is a very new concept. It is difficult to implement the e-waste management rules.
- India is producing e-waste equal to any developed country. Not only that, it even imported e-waste from other developed countries. This is increasing the problem more.
- People are aware about e-waste as problem but do not know how to manage.

- Techno-savvy attitude and constant upgradation in electronic devices has increased the problem of e-waste.
- To tackle the problem, government must invest and encourage people for new innovative e-waste management techniques.
- Even though e-waste management rules 2016 has put pecuniary punishment on manufacturers and producers who do not fulfil their responsibility given under the said rules; they are not complying with the rules. So many e-waste management companies have been incorporated after commencement of the said rules but it goes into vain as producers are not fulfilling their responsibility. Even it seems to be long term target which has been set for producers under EPR and it is not Possible to achieve by the government. So there is need for more strong laws which will have a deterrent effect on producers.

Suggestions - The following are some of the suggestions for e-waste management -

1. Provide discounts when buying new products in exchange for e-waste at the time of purchase. This way, collecting e-waste will become easier and then the waste can be sent to some central e-waste management agency.
2. The novel technique in South India is quite useful using e waste for generating electricity and recycling it and purifying water is noteworthy. Making it an important way to deal with fast growing hazardous waste in the nation is a step in the right direction.
3. Government agencies should monitor e waste processing.
4. Weekly drive by Municipal Corporation or by any other organisation can be started for collection of e-waste. It may be difficult to convince them but over time it will become a habit for disposing it in that manner.
5. Strict steps should be taken by government towards e-waste management similar to those taken for plastic ban.

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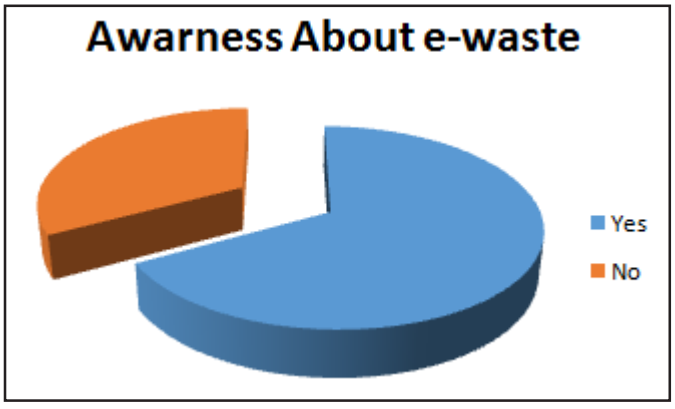

Figure 1

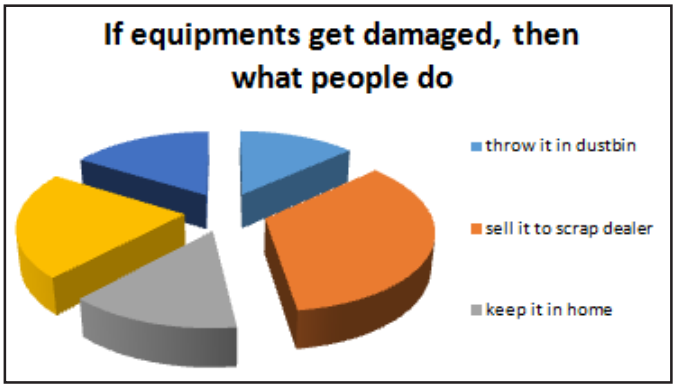

Figure 2

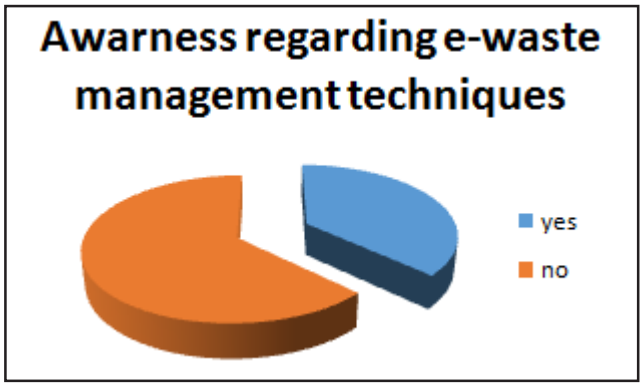

Figure 3

E-Waste Components and Its Effect On Environment And Health

E-waste component	Process	Potential environmental hazard
Cathode ray tubes	Break, Remove copper yoke and dump	Lead, barium and other heavy metals leak into ground water and release of toxic phosphor
Printers/ circuit boards	Disorder and remove computer chips	Air radiation of the same substances
Dismantled printed circuit board processing	Open burning of waste boards	Tin and lead contamination of immediate environment, including surface and ground waters, brominated dioxins, beryllium, cadmium and mercury inhalation
Chips and other gold-plated compounds	Chemical stripping using nitric and hydrochloric acid along riverbanks	Hydrocarbons, heavy metals, brominated substances etc. discharged directly into river and banks. Acidifies the river destroying fish and flora
Plastics from the computer and peripherals	Shredding and low-temperature melting	Emission of brominated dioxins and heavy metals and hydrocarbons
Secondary steel or copper and precious metal smelting	Furnace recovers steel or copper from waste	Emission of dioxins and heavy metals
Wires	Open burning to recover copper	Hydrocarbon and ashes, including PAHs discharged into air, water and soil

Adapted from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2796756/table/T0001/

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A Study on The Role of Green HR for a Sustainable Tomorrow

Maryam Tariq* **Ahsan Choudhary****

Abstract - Clean air to breathe, clean water to drink and green grass to walk on will become a distant dream for our future generations if we do not protect our environment today. Creating a sustainable future is the greatest challenge confronting mankind today.

The impact of our daily activities on the environment over a period of time has led to the need to go green not just at an individual level but at organizational level as well. Manufacturing plants and business houses have been using natural resources from the environment since their inception which has now led to huge imbalances. The condition has worsened to the extent that the quality of air in the major cities of India has been declared unsafe. People are resorting to the use of masks for their protection. It's payback time now. It is the time to take action. Organizations and governments are taking steps to save the environment.

The objective of this paper is to find out the green practices used in organizations. A survey questionnaire was made and circulated to people working in organized sector in Mumbai. Over 50 employees working in varied industries have responded to the survey.

Key Words - Environment, Green HR, Green workplace, Sustainability.

Introduction - Green HR denotes the contribution of HR policies towards a clean and eco-friendly corporate environmental agenda of protection and preservation of natural resources. The impact of our daily activities on the environment has resulted in the necessity of going green not only at an individual level but also at an organizational level. However, slowly and steadily corporate houses are taking action to preserve nature and maintain a keen focus on 'the sustainable environment' has somewhat become a philanthropic agenda in the corporate world.

The Green Human Resource Management is based on green movement with the sole objective of protection of environment from its hazardous activities without harming the profit of the organization.

Green HRM will also help the employers and the organization in building a good corporate image and brand in the market by strictly adhering to implementation of ISO 26000, environmental audit, relating to waste management and pollution. Even the new Companies Act 2013 makes it mandatory for companies having a net worth of more than 500 crores and annual turnover of 1000 crore or more to contribute towards the betterment of society.

Excess consumption of natural resources as a means of raw material by the industries and other commercial organizations need to be controlled. There is a tremendous pressure on corporate giants for contributing to the preservation of natural resources of planet Earth to maintain ecological balance and bio diversity.

Some companies have taken the initiative to **Go Green** in the following ways:

- Conducting energy audit
- Going paperless – using emails
- Recycling resources – recycle glass, paper, plastic etc.
- Reducing business travel – teleconference instead of travelling
- Implementation of green manufacturing process – using energy efficient equipment.

Literature Review -

The Need to go Green - Exploitation of natural resources has led to organizations being more conscious about the growing importance of integration of Environmental Management and Human Resource Management. Organizations believe that employees must be inspired, empowered and environmentally aware of greening in order to carry out green management initiatives. Moreover many CSR activities are conducted to spread awareness on this issue.

A survey conducted in the United Kingdom depicts that there is a preference of seeking employment in those companies which rank high in terms of environmental performance **(Anthony et. al, 1993)**. Brio et. al (2003) observed that a majority of employees give higher importance to those firms which have active carbon emission reduction policies. Thus a Green HR policy not

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only improves the brand image of the company but also builds strong foothold for achieving higher employee motivation levels, a better competitive advantage and a more concrete relationship with the suppliers, customers and the organizational workforce, an overall growth is assured by going green.

According to Victor (2008), one half of HR professionals indicated that their organizations have a formal or informal environmental responsibility policy. Top three green practices reported by HR professionals were encouraging employees to work more environment friendly, offering recycling programs and donating / discounting used furniture supplies. Today business leaders are embracing Corporate Sustainability and Green Business practices as a way to improve their operations and enhance their competitiveness **(Rathgeber; 2007)**.

Many organizations were quick to jump onboard the Sustainability bandwagon, little appears to have been done to consider the role of, and effect on, the HR function and managers **(Harris, C. and Tregidga, H.; 2008)**.

In recent times, the urge of going green with an aim to sustain the environment has not only increased in developing nations but also the under developed ones. The reason for such an action derives from environmental issues that are currently faced all over the world and if actions aren't taken to change the organizational management and activities then a major concern looms over future generation. It is not only the nature that gets effected by green human resource policy, survey reveals that going green boosts employee morale, reduce labor turnover, and becomes a hub for top quality human talent. Successful green management shows that companies have saved costs and how small steps can make a positive impact on the organization.

John Sullivan (2009), in his paper has stated that environmental issues are on almost every one's mind so if your firm has a competitive advantage in this area, it will create an employment brand. Green recruiting is a chance to differentiate yourself in a recruiting market place where standing out from the crowd is already extremely difficult. According to Fineman (1997:37), the environment belongs to everyone; its damage is quintessentially a matter of broad consensual moral concern and organizational actors are as culpable as anyone else. So HR managers are requested to reconsider the implications of what their passive position on the environment could mean by giving them important role of shaping employees behavior in organizations and beyond.

Research by SuhaimiSudin (2011), shows that green management initiatives have become an important factor in businesses around the world. Researchers argued that employees must be inspired, empowered and environmentally aware of greening in order to carry out green management initiatives.

Stephen King (2004) stated that the future of HRM will be built on innovation and creativity. Through creatively approaching environmental issues, one can bring out innovative solutions to deal with the environmental problems.

Objective of the research

- Provide a basic understanding of green HRM to the readers.
- Highlight the green initiatives taken by employees at their respective work places.

Research Methodology - Primary data was collected with the help of a structured questionnaire from employees working across various sectors in and around Mumbai. Secondary data sources like newspapers, magazines, journals and various others online data sources have been referred to for collecting existing literature on the topic.

Samples - Sample size is 39 and have been collected from professionals working in various industries in various sectors. With reference to the literature referred and the understanding of the researcher a list of activities were identified that could be done by corporate and business houses to contribute to an eco-friendly environment and thus promote Green HR.

Following activities have been identified -

- **Company Transport facility –** to and fro from work-place to convenient common area for most of the employees.
- **Carpooling/Vehicle Sharing –** Promoting employees to pool and travel by providing lucrative incentives (dinner coupons, shopping coupons) and acknowledgement.
- **Bring Your Own Device –** To save cost on machine and its maintenance, offices can have a policy of BYOD, wherein employees bring their own laptop to work or use their own mobile phone for office work and in return the office can insure the products or pay for the Annual Maintenance Contract.
- **Eco-friendly Waste Management System –** Simply having two bins separate for wet and dry waste, for separate bin for paper – which can be recycled, such small steps help to a very large extent in managing waste right from its origin.
- **Use of Email for notices and Circulars -** Unless not extremely essential any information to be conveyed to the office employees can be sent across email rather than being printed and circulated.
- **E-filing of data –** All records to be maintained and to be regularly updated on the cloud rather than keeping papers and files as records. In the long run this would be more useful as it would enable access to data anytime and anywhere from the cloud. Furthermore, files need space to be kept and maintained and any physical damage would render the papers useless.
- **Use of Video Conferencing for meetings –** It would help overcome the paucity of time and the need of the physical presence for any important meeting thus saving on travel time and expenses.

Inference from the survey - Out of the various activities

mentioned, most offices use email for any notices and circulars. Many offices also focused on e-filing of data for their ease and convenience.

Employee management was largely done online by majority of the offices wherein employee data, leaves, attendance, and salary slips all were managed without the use of files and papers.

As far as recruitment is concerned, with so many online job portals being available, the new trend is e-recruitment. But yet employers and corporates need to accept the new changes and potential candidates should make the best use of this option as well. As per the survey, people still rely heavily on referrals for any big opportunity and companies also don't want to spend so much time in the screening and filtering of resumes submitted online.

Still a lot has to be done by both employers and employees in promoting Green HR.

Suggestions and Conclusion - The environment can be no one person's or one government's concern, each and every human being is responsible for its sustenance. As part of their CSR initiatives corporates should imbibe eco-friendly practices into their day-to-day activities. Employees and employers should be sensitized about the importance of the matter. The damage to the environment cannot be undone, yet each one of us can strive to sustain nature and its resources. The past cannot be changed; the future is yet in our power.

Limitations of the Study - The study was limited to the respondents working in varied sectors in and around Mumbai. The data was collected by a questionnaire designed and administered by the researcher wherein the areas which were to be measured as Green HR initiatives were clearly identified.

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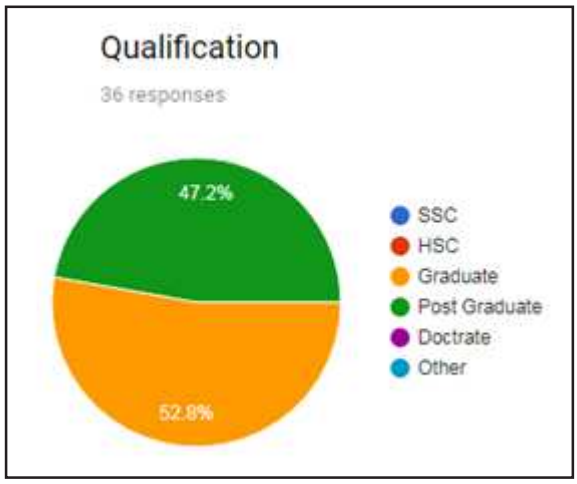


Fig. 1

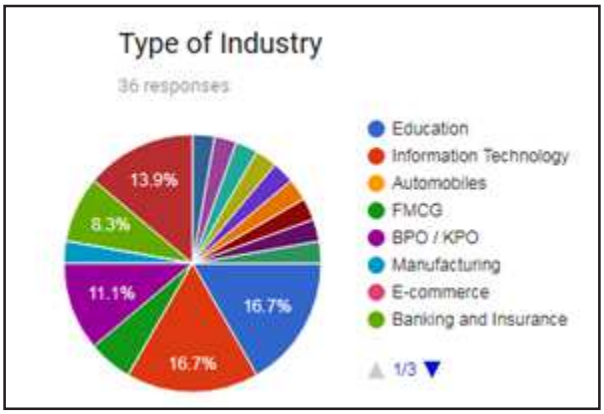
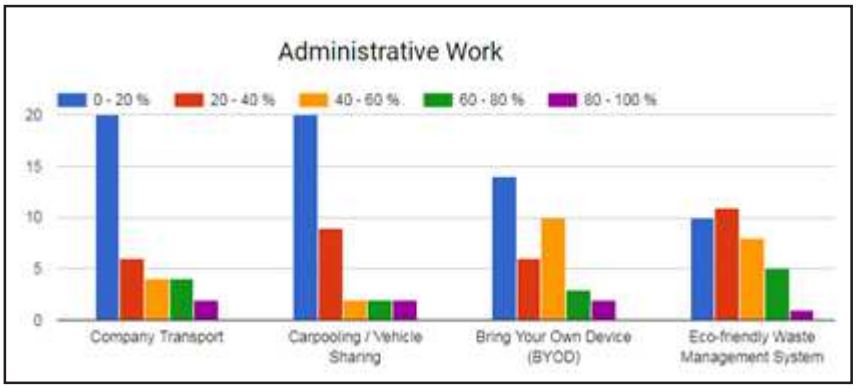


Fig. 2

Fig. 3


Administrative Work
0 - 20 %
20 - 40 %
40 - 60 %
60 - 80 %
80 - 100 %
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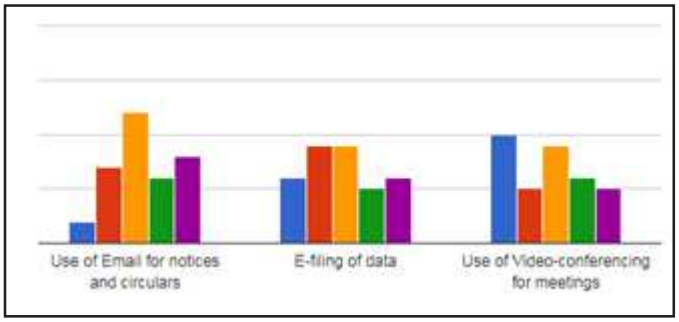
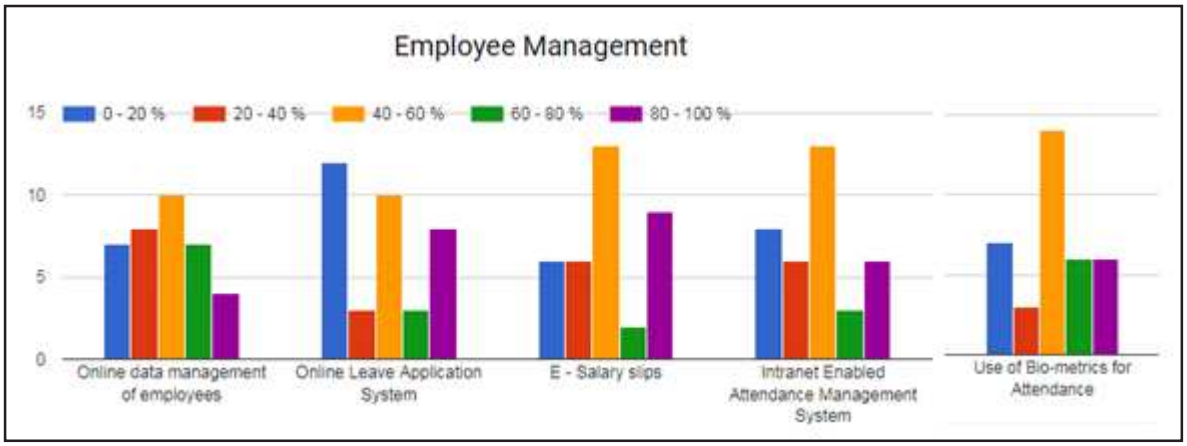
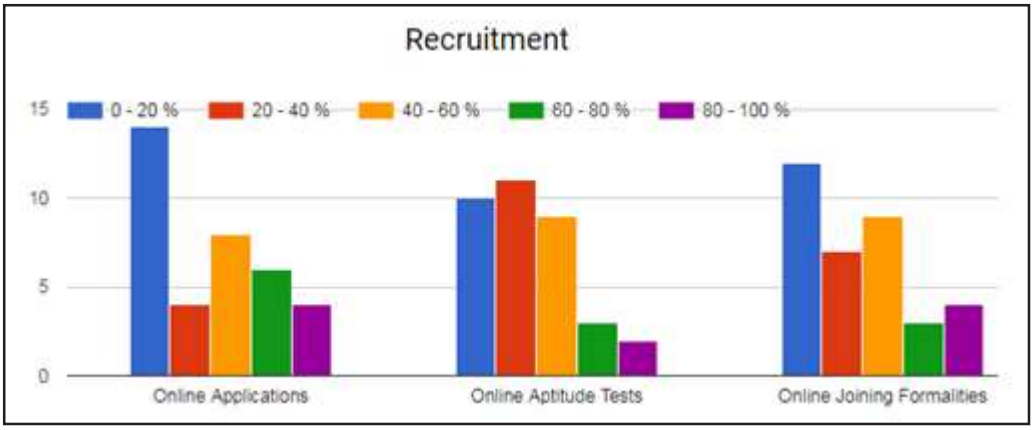
Company Transport
Carpooling / Vehicle Sharing
Bring Your Own Device (BYOD)
Eco-friendly Waste Management System


Use of Email for notices and circulars
E-filing of data
Use of Video-conferencing for meetings


Employee Management
15
10
5
0
0 - 20 %
20 - 40 %
40 - 60 %
60 - 80 %
80 - 100 %
Online data management of employees
Online Leave Application System
E - Salary slips
Intranet Enabled Attendance Management System
Use of Bio-metrics for Attendance


Recruitment
15
10
5
0
0 - 20 %
20 - 40 %
40 - 60 %
60 - 80 %
80 - 100 %
Online Applications
Online Aptitude Tests
Online Joining Formalities

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Sustainable Agriculture : A Study of Navdanya Movement in India

Muneerah Khambhawala *

Abstract - Sustainable development has become a buzzword since the release of the Brundtland Report by United Nations in 1987. Though the United Nations 2005 World Summit Outcome Document considers economic development, social development and environmental protection as the three interdependent and mutually reinforcing pillars of sustainable development; indigenous people have always stressed to include cultural diversity as the fourth one. In consonance with this view, Economic Sustainability: Agenda 21 identifies information, integration and participation as key building blocks in sustainable development. Development that does not value traditional wisdom is seldom sustainable. This has become clearly evident from the contemporary crisis in Indian agriculture; a consequence of Green Revolution. The very nature of the Green Revolution package, standing in stark contradiction to traditional farming, has created a crisis of non-sustainability; both ecological and economic. Consequently, sustainable agricultural practices based on accumulated wisdom have emerged at the grass root levels to combat agricultural predicament and conserve agricultural biodiversity and environmental sustainability. *Navdanya*, founded by Vandana Shiva, is one such initiative designed on the principles of organic farming. It is a movement that provides ecological security as well as economic security to small and marginal farmers. According to Shiva, it is an alternative to industrial agriculture and globalised agriculture; Green Revolution and Genetic engineering. In this context, the paper attempts to analyse this movement as a case to explore the possibility of organic farming in meeting the objectives of sustainable agriculture and in turn sustainable development.

Keywords - Sustainable development, sustainable agriculture, *Navdanya*, organic farming, traditional wisdom.

Introduction - Sustainable development has become the buzzword since the release of the Brundtland Report by United Nations in 1987. The Report defines it as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

Even in the globalized era, agriculture continues to play a significant role in several Third World countries. In the Indian context, agricultural sector contributes not only towards a major share in Gross Domestic Product (GDP) but also ensures food security and gainful employment to two-thirds of its labour force. **(National Mission for Sustainable Agriculture: Strategies for Meeting the Challenges of Climate Change:2010, P-1).** Agricultural productivity is closely connected with other economic sectors thereby having a multiplier effect on the entire economy. For example, agriculture produce serves as raw materials for industries such as textiles, sugar, jute, food and milk processing and the like (ibid).

On the other side, one is witnessing a serious crisis in contemporary Indian agriculture. The utopian vision that Green Revolution would solve our food security issues has withered away. On the contrary, its long-term effects on soil and environment have opened up the debates on the issue of sustainability of both agriculture and environment. Consequently, several sustainable agricultural practices such as organic farming have emerged to combat the harmful consequences to land, people and environment.

Objectives - Situated in this context, the **primary objective** of the paper is to understand the nature and scope of organic farming. This in turn will enable us to gauge its role vis a vis conventional farming practice. **Secondly**, by using *Navdanya* as a case, the paper seeks to explore the possibility of organic farming in meeting the objectives of sustainable agriculture and in turn sustainable development. The exploratory nature of this research on *Navdanya* also intends to serve the twin objective of creating awareness about this movement and thus attracting further research on it.

Research Methodology - The paper is based on secondary data source. The *Navdanya* website, in particular, has been explored extensively for an in-depth understanding on the various facets of the movement. In addition, the government reports, books and scholarly articles from internet are used.

Green Revolution: An Analysis - Undoubtedly, the technological breakthrough of Green Revolution[1] has increased the production with the use of high-yielding varieties, chemical fertilizers and pesticides. But it has

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brought with it several unanticipated consequences[2]; most important being land degradation and desertification[3]. The use of pesticides and chemical fertilisers has increased the dependency of farmers and the land on them. Another area of concern is that while in traditional farming, seeds are preserved for the next cycle, the new hybrid seeds manufactured by corporates have to be purchased each year. The lure of the short-term gains blinds the long-term cost of permanent damage to the land[4]. These get compounded by fact that the current (economic) development process emphasizes 'long-term intensive industrial growth and high consumption lifestyles and preferences' **(National Mission for Sustainable Agriculture: Strategies for Meeting the Challenges of Climate Change:2010, P-2).** Consequently, sustainable agricultural practices came to gain prominence.

Sustainable Agriculture: Organic Farming - According to the Food and Agriculture Organization (FAO), sustainable agriculture is "the successful management of resources for agriculture to satisfy changing human needs while maintaining or enhancing the quality of environment and conserving natural resources" **(quoted in Gaur M: 2016)**[5]. There are other definitions too but the basic premise of all the definitions accentuate on maintaining an agriculture growth such that it meets the demand for food of all living things without draining the basic resources.

There is increasing realization to adopt sustainable agriculture practices even in India. This can be known by the fact that the National Action Plan on Climate Change (NAPCC) has included National Mission for Sustainable Agriculture (NMSA) as one of the eight Missions with the objective of promoting Sustainable Agriculture[6]. The aim is to come up with measures 'to make Indian agriculture more resilient to climate change' especially on 'improving the productivity of rainfed agriculture' (ibid). This, the Mission recognizes, can be achieved only by acknowledging and embracing the traditional wisdom of farmers in modern agricultural practices.

Organic farming[7] gained attention as an alternative system of farming since it addresses the issues of 'quality and sustainability'[8] by providing a 'debt free, profitable livelihood option'. But organic farming is not new to India. In fact, it is based on the principles and practices[9] similar to traditional farming. The United States Department of Agriculture (USDA) study team on organic farming defines it as "a system which avoids or largely excludes the use of synthetic inputs (such as fertilizers, pesticides, hormones, feed additives etc) and to the maximum extent feasible relies upon crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilisation and plant protection".

Realising the potential of organic farming[10], it is increasing on a rapid scale. It is practiced in 154 countries of the world and one finds its share of agricultural land and farms to be increasing in many countries[11] This data was released at BioFach 2010 at Nuremberg.

Navdanya Movement[12] **-** Founded by eco-feminist Vandana Shiva, *Navdanya* emerged in 1989 to provide alternatives to the Green Revolution and Genetic Engineering. It is based on the philosophy of 'Vasudhaiv Kutumbakam' (the earth as one family) and seeks to achieve the twin objectives of ecological security and economic security of small and marginal peasants. As a network of seed keepers and organic producers across eighteen states in India, Navdanya offers training for bio-diversity conservation and organic farming.

The name '*Navdanya*' is quite fascinating and reflects the true spirit of the movement. The word '*Navdanya*' means 'nine seeds' symbolizing protection of biological and cultural diversity. And it also means 'new gift'; the gift (dana) of the Navadhanyas (nine seeds) in the age of monoculture agricultural practices. Navdhanyas stand for 'gift of life, of heritage and continuity'. The movement believes that 'conserving seeds is conserving bio-diversity, conserving knowledge of the seed and its utilization, conserving culture, and conserving sustainability'.

Four main programmes of *Navdanya* that protect the biodiversity and food heritage are Bija Swaraj, Anna Swaraj, Bhu Swaraj and Gyan Swaraj.

Bija Swaraj - 122 Community Seed Banks have been created in 18 states of India and Bhutan. These cater especially to the farmers affected by natural disasters[13].

Anna Swaraj - This programme raises awareness of farmers as well as consumers about the benefits of organic farming and organic produce[14].

Bhu Swaraj - Aimed at keeping the mother earth healthy and free from hazardous chemicals used in fertilizers, insecticides, pesticides etc by using organic and agro-ecological practices; thus sustaining the ecosystem.

Gyan Swaraj - Navdanya takes pride in traditional wisdom of farmers accumulated over centuries. Therefore, this programme is intended to emancipate indigenous knowledge from the clutches of capitalist agriculture economy. Knowledge democracy and knowledge sovereignty achieved through scientific researches show the significance of bio-diversity for food security and ecological sustainability in the long run.

The four programmes help in achieving the mission 'To protect nature and people's rights to knowledge, biodiversity, water and food' and in turn accomplish the vision of Earth Democracy that is 'the participation of all people and species in the common welfare of all'.

Vandana Shiva views the vision in consonance with Article 25 of United Nations Universal Declaration of Human Rights. According to Shiva, since all humans have a 'fundamental right to ecological, economic and political security', *Navdanya* aims at creating alternatives to gigantism, centralisation and globalisation. This would release the marginalized majority[15] from the clutches of corporate driven economy and ensure their livelihoods.

Further, Shiva asserts that bio-diversity is 'ultimate

commons' and consequently should not be 'privatised and commodified'.

Scope - *Navdanya* is not only a network of seed keepers and organic producers across several states in India but it also is a training centre for bio-diversity conservation and organic farming. It has trained over 500,000 farmers. To ensure economic viability, *Navdanya* has set up fair trade organic networks in India.

Protection of the traditional knowledge and indigenous biodiversity has been the primary focus of *Navdanya*. For this, they have successfully fought against biopiracy, GMO foods etc.

The Bija Vidyapeeth (School of the Seed /Earth University) is a learning centre in Doon Valley, Uttarakhand and North India.

Navdanya Javik Ashram, that is, Navdanya Biodiversity Farm organizes courses and training programmes for people to extend ecological awareness.

To ensure women's empowerment, 'Diverse Women for Diversity' works at local, national and global level. The women led groups aim to create food sovereignty by protecting livelihoods and preserving culture and women's knowledge and skills.

Grandmother's University fosters trans-generational responsibility. It ensures not only the transmission of the traditional knowledge of the previous generation to the next but in a manner that they honour and cherish it.

The Way forward - Sustainable development is a continually evolving process; a journey aimed at simultaneous pursuit of economic prosperity, environmental quality and social equity - Triple Bottom Line. An analysis of Navdanya movement reveals that organic farming holds the potential to negate the global trend of synthetic farming practices by going back to indigenous practices. As Shiva rightly puts in that, we must strive for 'globalisation of the local'.

Further, organic farming also holds the scope of achieving livelihood security for the poor and the marginalized. A concerted effort at increasing the agency of women does bring about their empowerment. For this, a platform such as Navdanya is required where women are able to participate in all decision-making aspects of sustainable and organic agriculture, as farmers, as researchers and as leaders.

Thus, it is the need of the hour to synergise modern agriculture research with the indigenous wisdom of the farmers to enhance the resilience of Indian agriculture. This is in line with Economic Sustainability: Agenda 21 that identifies information, integration and participation as key building blocks in sustainable development.

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Footnotes :

1. After the end of the World War II, nitrate fertilisers used in ammunitions and pesticides developed for protecting the soldiers from lice and mosquitoes, opened up new opportunities of increasing agricultural productivity. New crop varieties were developed that responded well to these fertilisers and pesticides.
2. According to a NDTV Report, the Malwa region in Punjab is nicknamed as the 'cancer belt' of India. This higher incidence of cancer cases, studies showed, are associated with the excessive use of pesticides for cotton crops
3. The fifth National Report on Desertification, Land Degradation and Drought (2015) revealed that one-third of India's land is degraded while 25 percent is facing de-

sertification (https://food.ndtv.com/opinions/organic-farming-in-india-a-success-story-1290265)

4. This has been pointed out by Dr Debjani Sihi, a researcher at the University of Maryland Centre for Environmental Science USA. Continuous use of chemicals in conventional farming has resulted in reduced productivity due to declining response to applied chemical fertilizers
5. Gaur Manisha (2016). Organic Farming in India: Status, Issues and Prospects, *SOPAAN-II Volume 1, Issue 1,* January-June 2016.
6. National Mission for Sustainable Agriculture: Strategies for Meeting the Challenges of Climate Change. P-1.
7. The foundation of organic farming is credited to the basic theoretical expositions of J.I. Rodale in the United States, Lady Balfour in England and Sir Albert Howard in India in the 1940s.
8. Sikkim's Chief Minister Pawan Chamling too is of the opinion that 'going organic is the primary way in which global warming can be tackled to a large extent' (http://ofai.org/2018/01/chamling-calls-for-india-to-go-organic/)
9. Techniques used in organic farming like inter-cropping, mulching and integration of crops and livestock are similar to those practiced in traditional agriculture in countries like India.
10. To cite a success story, the organic farmers from Gondia and Chandrapur districts could prevent their crops from pest attacks using natural fertilizers; thus reaping rich harvest of paddy
11. This data was released at BioFach 2010 at Nuremberg
12. The website of Navdanya is used extensively to provide deeper insights and better understanding of the movement.
13. Farmers affected by disasters such as Odisha Super Cyclone, Tsunami, Floods in Uttarakhand, Phailin in Odisha and earthquake in Nepal
14. Navdanya's campaign on Food Smart Cities links the city to villages via healthy and safe food.
15. Marginalized majority, according to Shiva, include women, peasants, tribals and fisher folk.

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Green Consumerism : Assessment of Awareness among Consumers

Bhagyashree Grampurohit *

Abstract - It is a duty of every citizen to protect the environment and green consumerism is the way by which this can be done. Green consumerism is consumption of products that are not harmful for the environment. Green products use safe ingredients; they are not toxic to the environment after disposal, use biodegradable material, use less natural resources and generate less waste. Green products can also be recyclable, bio-mimicing and involves less packaging. It is observed that there is lack of awareness about various environmental issues, lack of publicity and marketing of green products. Less options available, high cost, doubt on authenticity of green products are some of the other related issues.

To assess the level of awareness, a structured questionnaire was used, in which the data was collected from ninety nine individuals from various backgrounds including students, teachers, and employees of service sector and self-employed. Age group chosen for this survey is 18 to 30 years from Mumbai suburbs.

Many people were aware of green products but they could not define all properties of green products. In spite of knowing the importance of green products, purchasing rate is found to be low. There were various factors affecting this purchase but the major factor was found to be lack of awareness. Social media sites are found to be effective medium for advertising green products. There is still lack of information of green markets and policies/ subsidies provided.

Key Words - Green product, Green business, Green consumerism, Awareness.

Introduction - The world is currently facing various environmental issues like global warming, pollution, waste mismanagement, scarcity of natural resources, population explosion etc. Many policies, acts and laws are in place to mitigate the impacts of these problems. Intensity of the adverse impact remains unchanged if there is lack of awareness, negligence towards environmental problems and ineffectiveness of policies. It is believed that government, policy makers and corporators are solely responsible for taking care of the environment. However, people are equally responsible for creating environmental problems and capable of controlling adverse impact if they adapt the green living strategies.

Green business and green consumerism is part of sustainable industrial practices. Green products use safe ingredients; they are not toxic to environment after disposal, use biodegradable material, reduce use of natural resources and generation of waste. Green products can also be recyclable products, biomimicing product and involve less packaging. Green consumerism is a practice of purchasing green products. This will definitely help us in achieving the goal of sustainable development. Green consumerism has led to the demand for green products.

However, green business should quickly respond to the expectations of consumers to increase its business, it should be effective in advertising its product, getting certifications like ecolabels etc.

It is observed that there is lack of awareness about various environmental issues, lack of publicity and marketing of green products. Less options available, high cost, doubts regarding authenticity of green products are some of the other related issues.

Materials and Methods - A structured questionnaire was prepared containing open ended and close ended questions. The data has been collected online by using google forms. This is a pilot survey containing 80 samples. The age group chosen for collecting this survey is 15 to 30 years (group of young adults) as young consumers are assumed to influence purchasing decisions of their families. (Martensen and Gronholdt, 2008; Ishaque and Tufail 2014) The study area of this research is Mumbai suburbs.

Observations -

1. Age group - Group of young adults were selected for conducting the survey. A total of 100 people participated in the survey out of which 20 percent were from the age group 15-20 years, 53 percent were from age group 20-25 years, 51 percent were from age group 25-30 years.

Figure 1

2. Gender - 54 percent females and 46 percent males participated in the survey.

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Figure 2 (

3. Occupation - All respondents in the survey were working. 41 percent of the participants were students, 19 percent of participants were teachers, 31 percent participants were in service sector, 8 percent of people were self-employed and 1 person was working in an NGO.

Figure 3

4. Most important environmental issue - Out of various environmental issues, people felt that the issue of prime importance is pollution. Few people were unaware of any environmental issue. People gave various answers like pollution, waste generation, plastic use, global warming, deforestation, resource utilization, water availability, population explosion etc. 34 percent people felt that pollution is an issue of prime importance, 28 percent people felt that global warming is an issue of prime importance, 10 percent people said it is plastic use, 9 percent people went for waste management, 5 percent, 4 percent , 4 percent and 1 percent said issues are deforestation, resource utilization, water availability and population explosion respectively. 5 percent people were unaware of any of the environmental issues that exist.

Figure 4

5. Awareness: Green product - 78 percent people were aware about the concept of green products while 22 percent were not.

Figure 5

6. Green product knowledge - When people were asked to define a green product to assess their knowledge about green product, 59 percent gave the correct answer. Multiple choices were given including less toxic product, product having less packaging and recyclable product. 29 percent people felt that only a recyclable product is green product, 7 percent people felt that only less toxic product is a green product. There was no response from 5 percent individuals.

Figure 6

7. Importance of consumption of green product - 78 percent people felt that green product consumption is important and 22 percent people feel that it is not important.

Figure 7

8. Green product purchase - Though 78 percent people felt that green product consumption is important, only 47 percent people purchase green products. 48 percent people don't consume any green product. 5 percent people did not give any response.

Figure 8 Purchase of green product

9. Motivation - To know what motivates people to buy green product, various options were given like quality of product, environment and health impact, design and appearance, promotion or advertisement, quality of a product etc. 76 percent people said that they will purchase green products for maintaining good quality of environment and their health, 15 percent people will purchase green product if the quality of product is better than ordinary goods.

Figure 9

10. Reason for purchasing ordinary good - Reason for purchasing ordinary goods were found to be lack of awareness by 39 percent of people, 23 percent people said it is lack of available options, 6 percent people feel that there is a fear of cheating, 10 percent people think that the cost of green products is higher, 15 percent people feel that there is no information available about green products and shops.

Figure 10

11. Mode of publicity - Around 51 percent people got information about green products from social media. 16 percent people got information from awareness programs conducted by NGOs, 14 percent people got it from newspaper and 12 percent from television. 7 percent people did not have any information on green products.

Figure 11

12. Awareness regarding policies and subsidies - 92 percent of the people were not aware of any policies regarding green products or any subsidy given by government. 3 percent people were aware about subsidy on solar equipment for farmers. 2 percent people were aware about subsidy given on organic fertilizers. 2 percent people were aware about recent plastic ban which is a step towards green consumerism but not a subsidy on any green product. 1 participant added a point that paperless banking is also a step towards green consumerism by Reserve Bank of India.

Figure 12

Result and conclusion - Unsustainable utilization of resources is the problem causing all other environmental problems like pollution. Developing this kind of thinking is a necessity. Most of the problems which people feel are of prime importance are highlighted in media like newspapers, social sites, advertisements etc. Many people are now aware of the concept of green product but certainly do not have enough information about it. People who participated in the survey were from different backgrounds but most of them were students and teachers. This might be one of the reasons for their awareness as Environmental Science is now mandatory in course curriculum. People do feel that switching to green products is important but they do not actually practice it. There are various reasons behind that. Most prominent reason is lack of awareness. Other than that lack of options, high cost and lack of information are also some of the issues. It is found that the impact on environment and health and quality of the product is the motivation behind purchasing green product. Social sites do help a lot in publicity of green products but keeping in mind the need of the customers if other media like television, newspapers and NGOs also try to generate awareness through effective publicity then green consumerism will surely increase. Also, there are subsidies given by government on some of the green products of which customers are unaware. If media focuses on publicizing of such schemes, then surely the issue of high cost while purchasing green products will not persist.

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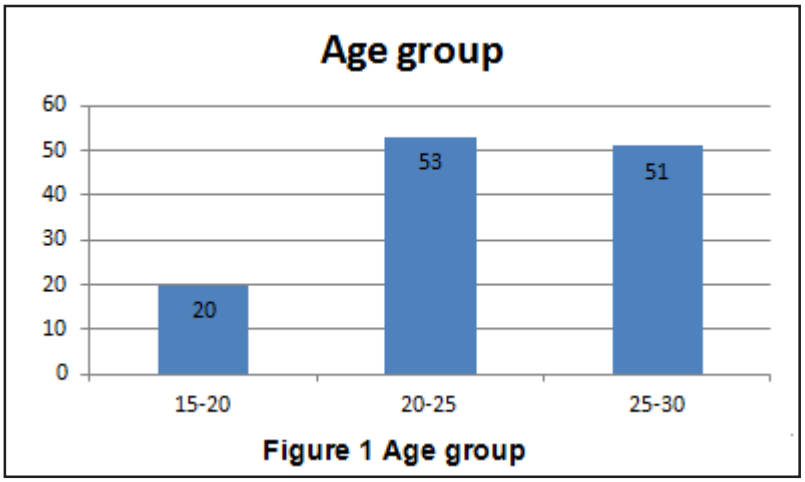

Figure 1 Age group

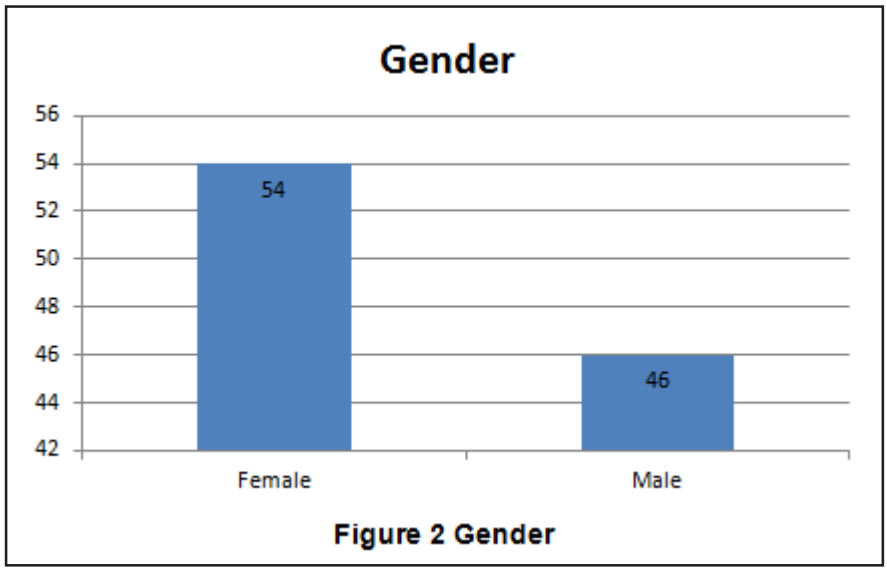

Figure 2 Gender

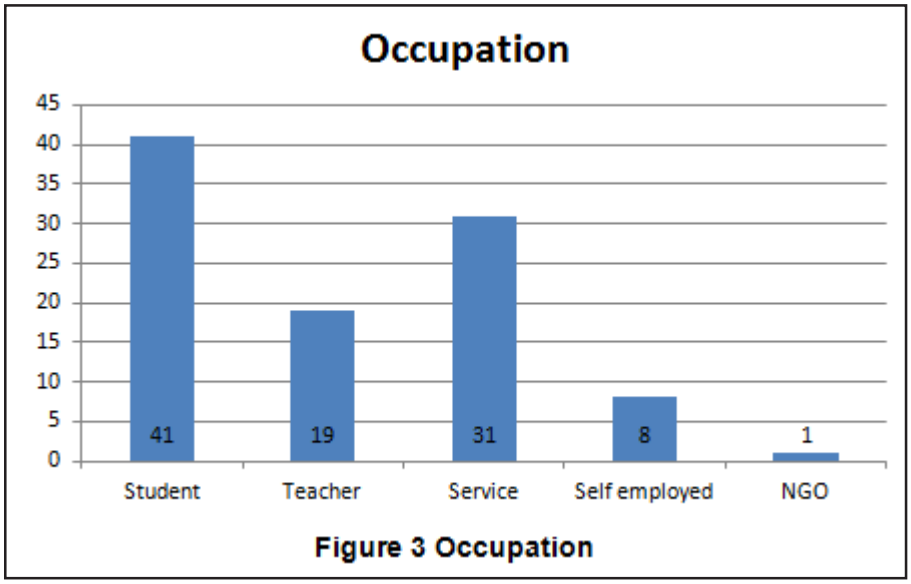

Figure 3 Occupation

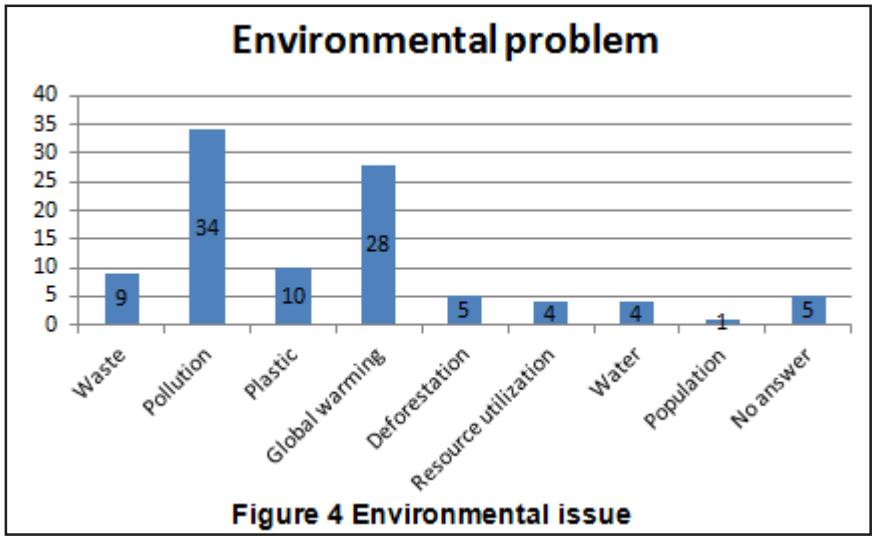

Figure 4 Environmental issue

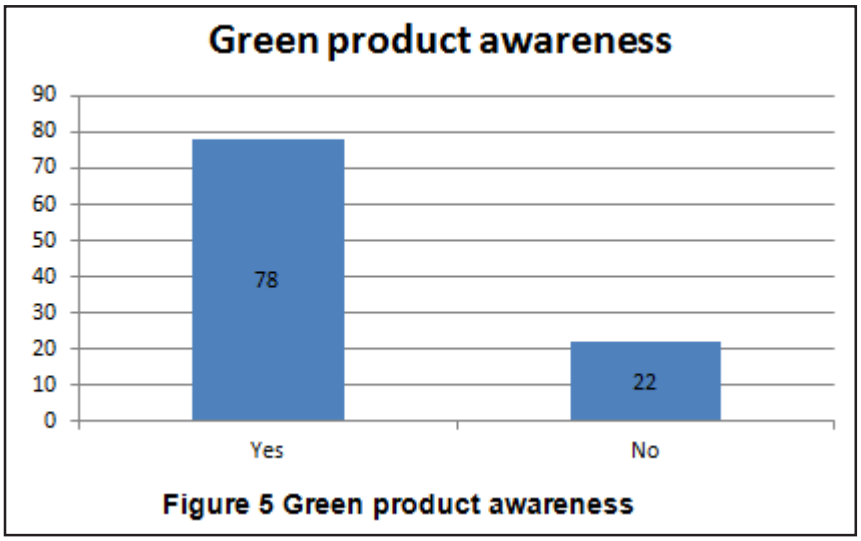

Figure 5 Green product awareness

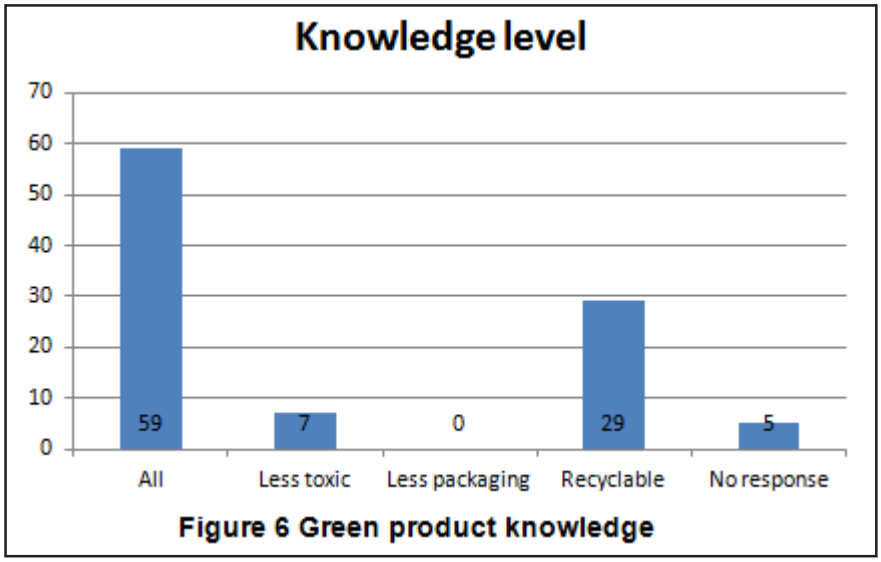

Figure 6 Green product knowledge

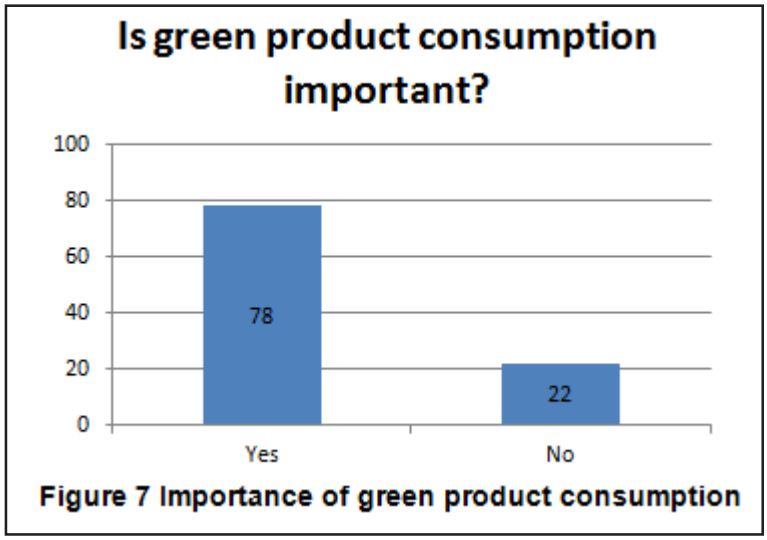

Figure 7 Importance of green product consumption

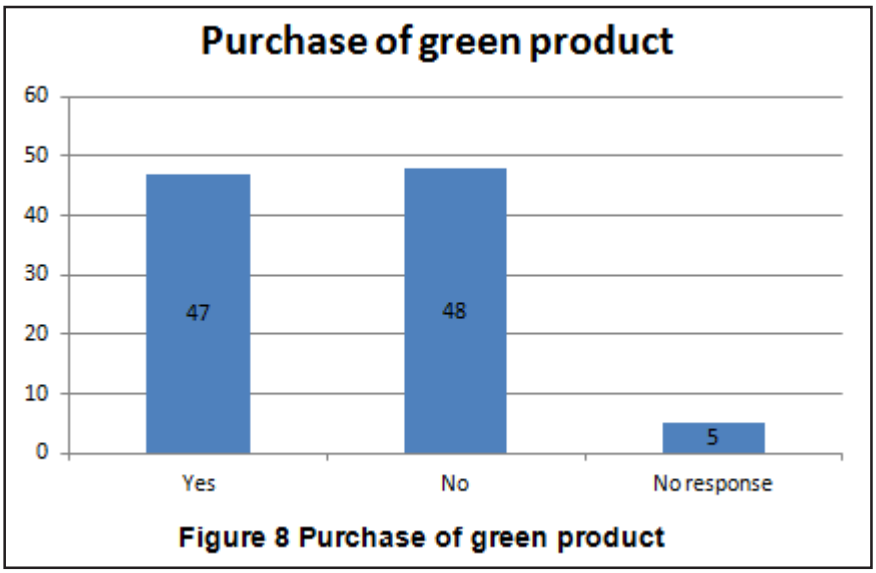

Figure 8 Purchase of green product

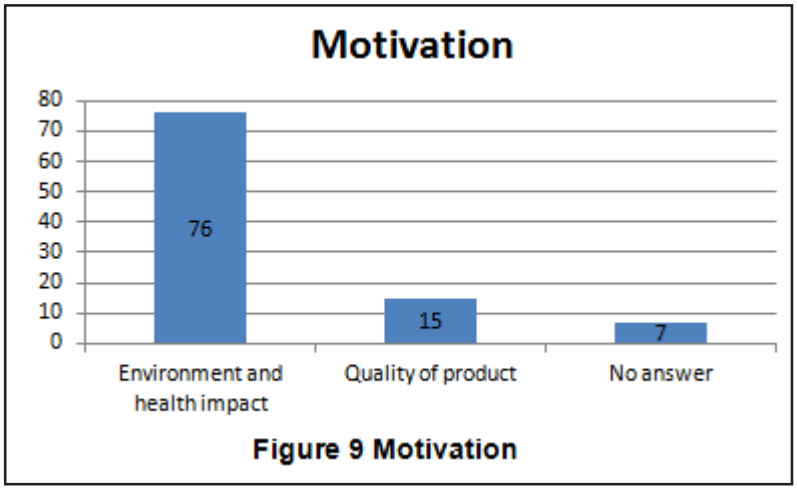

Figure 9 Motivation

Figure 10 Reason for purchasing ordinary goods

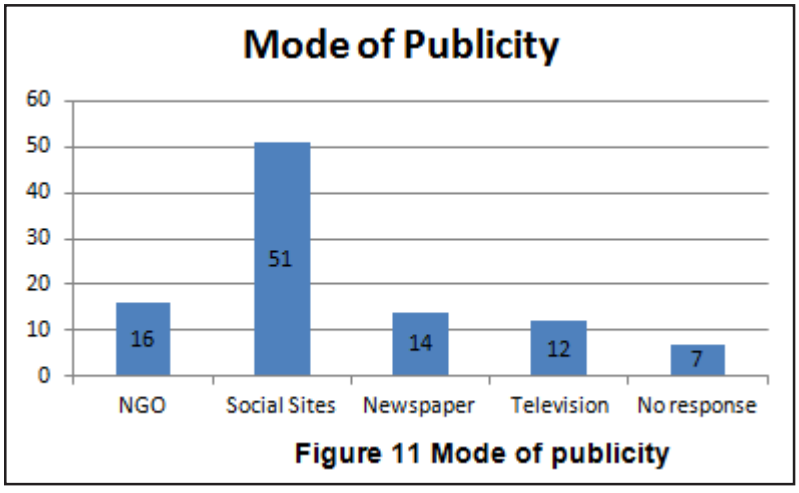

Figure 11 Mode of publicity

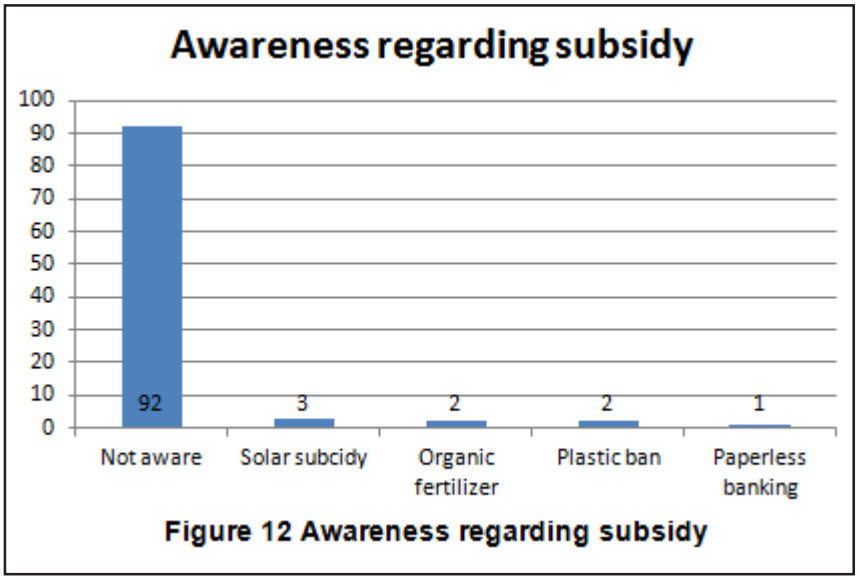

Figure 12 Awareness regarding subsidy

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Urban Arboriculture : A Footstep by Kirti College Towards Sustainable Environment Development

Dr. Urmila Sarkar* Dr. Smita Jadhav**

Abstract - In the rapidly altering scenario of climate change, arboriculture, is one of the approaches to contribute towards conservation of urban environment. Urbanization and industrialization are the prime reasons for climate change. In metro cities presently very less space is available for plantation of trees. Many institutes have developed and nurtured trees. These institutes contribute towards urban environment development in their own way by creating awareness among the student fraternity. Kirti College is one such institute which has quiet a good number of indigenous trees. Our paper gives a brief account of trees planted in the college and also discusses their beneficial values.
Key Words - Arboriculture, Sustainable development, indigenous.

Introduction - During the bygone era, human actions have released huge volumes of carbon dioxide and other greenhouse gases into the air. Most of the gases come from burning fossil fuels to yield energy. Greenhouse gases are similar to a blanket around the globe, trapping energy in the atmosphere and producing it to heat. These greenhouse gases are essential for sustaining life on earth. While these gases accumulate, the climate changes and results in hazardous effects to human wellbeing and ecosystems. The Earth's climate has transformed all through history. The current warming trend is of particular significance because most of it is extremely likely (greater than 95 percent probability) to be the result of human activity since the mid-20th century and proceeding at a rate that is unprecedented over decades to millennia[1]. The heat-trapping nature of carbon dioxide and other gases was demonstrated in the mid-19th century[2.] Earth's average surface temperature has risen about 2.0 degrees Fahrenheit (1.1 degrees Celsius) since the late 19th century, a change driven largely by increased carbon dioxide and other human-made emissions into the atmosphere.[3]Global sea level rose about 8 inches in the last century. The rate in the last two decades, however, is nearly double that of the last century. Extreme meteorological conditions have started aching cities with terrifying frequency. There is a strong need for constructing climate resilience in cities, but low public awareness, old-fashioned means of urban planning in India and absence of capacity to respond to climate disasters present a somewhat gray scenario.

India is the fourth largest emitter of greenhouse gases internationally, following China, the United States, and the European Union. Though India still has a low per capita carbon level, due to its large population and growing economy, its share of global greenhouse gas emissions is rising. India is, thus, a particularly important country to examine in relation to climate change. The impact of climate change poses considerable risk to Indian cities. Cities like Delhi, Kolkata, Chennai, Mumbai etc. have very less breathing space due to over growing population, developing infrastructure, increasing number of vehicles, industries and many more such reasons. Mumbai city is blessed with an urban forest within itself. SGNP, Maharashtra Nature Park, Aarey forest are the lungs of the metro city. Mumbai also has a good number of gardens like Veer Jijamata Udyan,Sagar Upwan (BPT garden), Priyadarshini Park and also number of Joggers parks and botanical gardens which are developed by the Municipal Corporation.

Boosting Arboriculture into the Future- Arboriculture is the cultivation, management and study of individual trees, shrubs, vines, and other perennial woody plants. Arboriculture is both a science and a practice, but it's all about nurturing trees, shrubs and other woody plants.[5] The science of arboriculture studies how trees grow and respond to their environments, as well as the techniques used to cultivate them. The practice of arboriculture is implementing those techniques used to maintain trees, such as selecting which trees to plant, applying fertilizer, spraying to control insects and diseases, cabling and bracing, diagnosing tree ailments, removing trees, transplanting and pruning. The mesmerizing thing about arboriculture is whether it be municipal, commercial, or institutional is that not only do the choices we make in our practices impact the sustainability of our environment, but our tree care practices are also powerful tools for creating a sustainable environment.Arboriculture as a practice for creating sustainable urban environments is multi-faceted.

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Essentially, these practices whirl around using woody plants to dispel the destructive byproducts of urbanization and to adapt natural systems that have been degraded by urbanization. We commonly call these 'ecosystem services' of trees, filtering air pollution, cleaning polluted water, enriching and protecting the soil, providing wildlife habitat, and mitigating the urban heat island. In urban communities, arboriculture clearly contributes to the health of the biological ecosystem; does it contribute to the health of the social ecosystem as well.[6.] Sustainable arboriculture begins with high-vigor, high-function tree species that are strategically planted in the urban environment, either in monoculture or polyculture. The worth and importance of urban trees and factors that meaningfully impact public support for protecting them. The paybacks of urban trees are as numerous and far-reaching as their roots, and these benefits grow over time.

Strategically planted and properly maintained, trees can generate returns up to three times their planting and maintenance costs. Urban forests comprise all city trees including 'street trees', trees in parks and preserves, and on private lands. Urban forests are social-ecological systems (SES), meaning they are systems in which social factors and ecological factors interact; they are also nested systems in which interactions occur at small scales (e.g., individual properties) to produce larger-scale effects.[7] Trees contribute to commercial growth, stronger communities, and a healthy environment. Not only do trees mean business, they make sense. Trees temper the special effects of weather conditions: Trees captivate solar radiation, providing cooler cover for living organisms. Tree species with dense foliage, such as certain evergreens, are particularly beneficial at easing robust winds when planted tactically. In Addition to this, trees gather storm water, which reduces the effects of runoff and the chance of flooding from severe rainstorms. In cities, trees reduce building energy use and allied costs by acting as both natural air conditioners and insulators. During the summer months, trees can lower peak air temperatures 2-9 °F by releasing water through their leaves and shading surfaces. A single large tree can cool an area as effectively as ten room-size air conditioners operating all day. During winter, trees can lower heating costs by providing a natural windbreak. Trees in urban areas generate a curative and peaceful environment that helps people recuperate from anxiety and tiredness.

A Brief of Kirti College with respect to its objectives - Kirti M. Doongursee College of Arts, Science and Commerce is located in Dadar, Mumbai. The college was founded by the Deccan Education Society as Bombay College. The foundation stone was laid by Maharshi Dhondo Keshav Karve and the college started operating in 1954. In 1960 Bombay College was renamed Kirti M. Doongursee College in a ceremony in the presence of Dr. Sarvepalli Radhakrishnan, the first Vice President of India. The objectives of this institute are to impart value-based holistic learning by integrating conventional and innovative learning practices to match the global standards, to develop the students to adapt better to the changing global scenario and equip them with diverse career opportunities and to sensitize students to acquire a set of values for environmental protection. Kirti College is located on a beautiful palm-lined plot on the Dadar sea-face at Kashinath Dhuru Road, off Veer Savarkar Marg, in the vicinity of Agar Bazar and the Portuguese Church. Due to its geographical location, breeze coming from sea side is one of the features which influences tree growth in the college arena. Winds having salt deposits influence the branching pattern in trees. For wind channeling we have planted trees having whorled branching patterns. All the trees in the college garden are labeled; hence students, support staff, teachers and visitors are aware about their presence and importance too. We have number of plants from the native of Konkan area. Labels with scientific and vernacular names make stakeholders much aware. Following is the list of plants in Kirti college garden.

Tree enumeration of Kirti college. **(See in the last page)**

Suggestions and Conclusions - Growing number of cities should design policies and programmes on urban arboriculture, applying multi-stakeholder planning approaches to recognize operative ways to integrate urban arboriculture into urban segment policies and urban land use planning and to qualify the development of safe and sustainable and multi-functional urban arboriculture. Urban arboriculture has the potential to become an active economic sector that can rapidly acclimatize to changing urban conditions and demands, escalating its productivity and spreading its functions for the city. Organizational strategy should generate the proper agenda for optimal progress of the social, economic and ecological benefits of urban arboriculture, whilst reducing negative effects on public health and environment that some types of urban agriculture can have if improperly managed or not well located. The sustainability of urban arboriculture is closely related to its contributions to the development of a sustainable and resilient city that is socially inclusive, food-secure, productive and environmentally-healthy.

Urban arboriculture will create awareness about urban tree vegetation, which will percolate to citizens through periodic awareness campaigns through students specially NCC cadets and NSS volunteers. Well planned campaigns will go a long way in motivation and protection thereby nurturing of trees within cities.

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Tree enumeration of Kirti college.

SN	Name of plant	Common/Vernacular Name	Family	Beneficial Role
1	*Mangifera indica*	Mango, Aam, Aamba	Anacardiaceae	Fruits edible, Religious tree, pollution sensitive, spreading canopy
2	*Polyalthia longifolia*	False ashok, Asopalav, mast tree	Anonaceae	Tall screening plant, useful for butterfly garden, wood straight tree trunk used as mast
3	*Delonix regia*	Gulmohar	Caesalpineae	Buttress roots spreading superficially on ground flowering tree, exotic
4	*Terminalia catappa*	Deshi Badam	Combretaceae	Whorled branches, useful for wind channeling, edible fruits suitable for frugivorous birds
5	*Putranjiva roxburghii*	Putrajivaka, Child life tree, Sutajjiva	Euphorbiaceae	Drooping branches, evergreen dense foliage avenue tree, aphrodiasic
6	*Casurina equisetifolia*	Suru, Beef wood,	Casurinaceae	Xerophytic, suitable for sandy soil serves as wind break
7	*Sterculia guttata*	Kokrus	Sterculiaceae	Tall evergreen tree, bark yields a valuable cordage
8	*Cocos nucifera*	Naral, Coconut	Arecaceae	Tall palm upper layer of wind break Emergent, Each and every part of the plant is used for various purposes.
9	*Roystonia regia*	Bottle palm	Arecaceae	Tall palm, seed is used as a source of oil and for livestock feed. Leaves are used for thatching
10	*Chrysalidocarpus leteus*	Golden palm	Arecaceae	Small palm used for ornamental purpose
11	*Livistonia chinensis*	Chines fan palm	Arecaceae	Fan leaved palm, found planted lining the roadsides, road-dividers and freeways,
12	*Caryota urens*	Jaggery palm, Fish tail Palm	Arecaceae	Sugar and alcoholic beverages are made using the sap and sago using starch from the stems.
13	*Woodetia bifurkata*	Foxtail palm	Arecaceae	Useful accent in a wide spectrum of landscape settings.
14	*Thespesia populnea*	Portia, Indian tulip, Paresha	Malvaceae	Avenue tree, Wood is mainly used in making furniture because of its good ability to undergo carving. The wood from the tree is used by Tamil people to make instruments

SN	Name of plant	Common/Vernacular Name	Family	Beneficial Role
15	*Callophyllum innophyllum*	Undi	Guttiferae	Evergreen tree suitable for sandy soil, oil obtained from seeds used as fuel and lubricant
16	*Tamarindus indica*	Chinch, imli	Papilionaceae	Evergreen tree, fruits and seeds are edible
17	*Pongamia pinnata*	Karanj	Papilionaceae	Seeds yield oil, leaves as green manure
18	*Cauropita guianensis*	Kailashpati, Canon ball tree	Combretaceae	Deciduous tall tree, religious
19	*Artocarpus incisa*	Vilayti phanus	Urticaceae	Evergreen tree, fruits used as vegetable
20	*Artocarpus integrifolia*	Jackfruit, Phanus	Urticaceae	Tall evergreen tree, fruits used as vegetable
21	*Sterculia foetida*	Bastard poon tree, wild almond tree	Sterculiaceae	Whorled branches, useful for wind channeling ,tall tree, avenue tree, The oil is used as biofuels.
22	*Mimusops elengi*	Bakuli, bullet wood tree	Sapotaceae	Evergreen tree, bark, flowers, fruits, and seeds of are used in Ayurveda medicine as cooling, anthelmintic, tonic, bleeding gums, pyorrhea and loose teeth.
23	*Morinda tinctoria*	Aal, Indian mulberry	Rubiaceae	Small tree, medicinal value
24	*Anona reticulata*	Ramphal, Bullock heart plant	Anonaceae	Tall evergreen tree, Fruits are edible
25	*Ficus religiosa*	Peepal tree	Urticaceae	Tall tree oxygenator
26	*Adenanthera pavoniana*	Gunj, Bead Tree	Mimosae	The young leaves can be cooked and eaten. The wood, which is extremely hard, is also used in boat-building, making furniture and for firewood.
27	*Calatropis gigantea*	Rui, Madar, Aak	Asclepiadaceae	Butterfly garden, breeding tree, latex is medicinal
28	*Saraca asoka*	Sita ashok	Caesalpineae	Medicinal, ornamental
29	*Peltophorum ferrugineum*	Sonmohar, rusty pods	Caesaipineae	Tall evergreen ornamental, the bark is used as treatment for sprains, bruises, swelling, eye problems, and body sore and intestinal disorders.
30	*Azadirachta indica*	Neem	Meliaceae	Medicinal
31	*Ficus glomerata*	Umbar	Urticaceae	Indian medicine, for various disorders including diabetes, liver disorders, diarrhea, inflammatory conditions, hemorrhoids, respiratory, and urinary diseases.
32	*Schizygium jambolana*	Jambul, jamun	Myrtaceae	Fruits are medicinal and edible.

SN	Name of plant	Common/Vernacular Name	Family	Beneficial Role
33	*Anona squamosa*	Sitaphal, shariffa	Anonaceae	The leaves are used to treat dysentery and urinary tract infection. In traditional Indian medicine, they are also crushed and applied to wound, natural insecticide
34	*Moringa pterigosperma*	Shevaga	Moringaceae	Young twigs, fruits are edible and medicinal.seeds useful for water purification
35	*Leucaena leucocephala*	Subabul	Mimosae	Paste made from the leaves is applied to poisonous bites and stings. green leaf manure
36	*Eucalyptus globosus*	Nilgiri	Myrtaceae	Fast growing tree, oil is used for cold and cough.
37	*Musa paradisiaca*	Kela, Banana	Musaceae	Fruits are edible. Fibers obtained from stem.

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Citizen's Perception on Swachh Bharat Abhiyan in Kalyan Dombivli Municipal Region

Suchitra Poojari*

Abstract - It is very essential to eliminate the open defacation, particularly in the rural areas of our country. Swachh Bharat Abhiyan or Clean India Mission is a national level mission started by Government of India on 145th birth anniversary of Mahatma Gandhi on 2nd October 2014 at Rajghat, New Delhi. This mission covers the rural as well as urban areas of India under the Ministry of urban development and the Ministry of drinking water and sanitation. The research article discusses the need and benefits of Swachh Bharat Mission. It analyses the Kalyan Dombivli citizens' perception on Swachh Bharat Abhiyan and the role played by the Swachh App introduced by Kalyan Dombivli Municipal Corporation. The required data will be collected using primary as well as secondary sources.
Key Words - Cleanliness, Impact, Awareness, Development, Smart City.

Introduction - The Prime Minister of India, Mr. Narendra Modi launched the Swachh Bharat Abhiyan campaign officially on 2nd October 2014 at Rajghat, New Delhi. It is the belief of our Prime Minister and sanitation department of the Government of India that ; 'Swachhata has to be everyone's business and not only that of sanitation departments'. About 3 million government employees, school and college students participated in this event and it is considered as India's biggest ever cleanliness drive. It is also a major sanitation drive with the aim of making India 'Open Defecation Free' (ODF) by 2019.

Objectives -

1. To understand the Swachh Bharat Abhiyan concept.
2. To know the need and benefits of Swachh Bharat Abhiyan.
3. To analyse citizens' perception on implementation of Swachh Bharat Abhiyan in Kalyan Dombivli region.

Research methodology - The data required for the present study is collected by both primary as well as secondary methods. Primary data is collected through survey method and secondary data is collected by referring to books, journals, magazines, newspapers and relevant online sources.

Swachh Bharat Abhiyan (SBA) in India - The objective of Swachh Bharat Abhiyan is to eliminate open defecation, waste management, and adopt healthy sanitation practices. The government, private organizations, NGOs, schools and colleges are actively participating in this mission. The society is already observing its impact and joining hands for further growth. According to the report in The Hindu dated on 12 May 2017, The 'Swachh Survekshan-2017' survey commissioned by the Union Urban Development Ministry revealed that more than 83 percent of the 18 lakh respondents across 434 cities and towns in the country feel that their areas are much cleaner than the previous years and respondents reported improvement in sanitation infrastructure and services like increased availability of litter bins and door-to-door collection of solid waste etc.

SBA Report:

SBA at Glance **(See in the last page)**

SBA coverage status - As per the graph shown below, the SBA coverage status is increasing year by year. It was only 38 percent in the financial year 2014-15 and at present it has covered 80 percent in the financial year 2017-18. It is more than the double fold as compared to the first year of SBA initiation. **(See in the last page)**

Swachh Bharat Abhiyan (SBA) in Kalyan Dombivli Municipal Region through Swachh KDMC App - KDMC has taken a unique step to launch Swachha Bharat Abhiyan. This app can be used by citizens to identify garbage, click its real time picture and post it in the app. The KDMC will clean up the reported site within the specified time period. Once citizens post real time pictures of the garbage, the location and the time at which the picture has been taken gets recorded. The system administrator of this app notes the same and will pass on the same to the 40 sanitary inspectors, who will coordinate the cleanup immediately. The report of the same will be posted/ updated in the app as a feedback mechanism.

Need and benefits of Swachh Bharat Abhiyan - India has a massive problem of open defecation and it develops problems like deaths of children, spread of infections and diseases and rape of young girls who go to deserted places to relieve themselves. Swachh Bharat Abhiyan has the objective of making India a 'Clean' India by stopping the problem of open defecation, building up of toilets for all

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households, providing running water supply, treating of solid and liquid wastes in a proper manner. Above all, the project aims at creating awareness among people about the need for proper sanitation and hygienic facilities. It is necessary to have proper waste management systems in both rural as well as urban areas. This mission brings behavioral changes and practices healthy sanitation methods among the citizens. With these changes, it improves the quality of life of people and realizes the dream of our father of nation, Mahatma Gandhi.

Citizen's Perception on SBA in Kalyan Dombivli - The present survey is conducted in the Kalyan and Dombivli area and the sample size of the study is 100 respondents. Out of 100 respondents, 53 are from Kalyan and 47 from Dombivli. The age group of the respondents varies from 18 to 60 years and the educational qualifications of the respondents are SSC, HSC, Graduate, Post Graduate, ITI etc. The respondents were asked to select the appropriate option on Swachh Bharat Abhiyan in Kalyan Dombivli twin city. According to the survey report, 72 percent respondents aware of Swachh app introduced by KDMC and 28 percent are not aware about the app. 62 percent are finding this app useful but the remaining 38 percent respondents are not happy with the functioning of the app. The survey reported that SBA will change the overall outlook and habits of the people. 83 percent respondents believe that the SBA changes the outlook and habits of the people and 17 percent feel that there will be no change in the lifestyle and habits of the people. 61 percent respondents find their area is much cleaner than previous years whereas 39 percent are not finding any changes after the implementation of Swachh Bharat Abhiyan. 57 percent says door to door collection of waste is been done properly and 43 percent disagreed.

Table No. 1

The researcher has used the 5 points rating scale to measure the Swachh Bharat Abhiyan working in the selected city. Rating 1 is considered as least and 5 is considered as highest. 18 percent respondents rated 1(least), 13 percent rated 2(average), 53 percent rated 3(good), 12 percent rated 4(very good) and only 4 percent rated 5(excellent). 10 percent respondents find their area always clean, 64 percent find their area sometimes clean, 13 percent find that their area is rarely clean and remaining 13 percent find their area is never clean. It also reported that 31 percent respondents are able to easily locate the dust bins, 31 percent sometimes, 16 percent rarely find the dust bins and 22 percent reported that they never find the dust bins easily nearby their area.

Table No. 2

Graph 1

According to the graph given below, only 6 percent of respondents had problems of toilet and sanitation. Some of them reported that KDMC approached them and promised to construct toilet and to provide the basic facilities. Only 2 percent respondents said that they did not have toilet facility.

Graph 2

The diagram below shows that much more improvement is required in the city. The SBA should be implemented in all the areas. It should not cover only the major areas. It also should reach the micro and remote areas of Kalyan and Dombivli region.

Findings of the study - It is observed in the present study that, Kalyan Dombivli citizens are aware of the Swachh app introduced by KDMC and they are finding it useful. The society is very much aware of the changes taking place around them. The twin city has very less problem in toilet and drinking water facility and only few areas are lacking in basic sanitation. Citizens believe that SBA will change the overall outlook of the Kalyan Dombivli as well as the Nation.

Conclusions - It is not easy to achieve 100 percent success in the Swachh Bharat Abhiyan in a short time. The place like Kalyan Dombivli has mixed combination of population. Therefore, to inculcate cleanliness habit is not so easy with this twin city of huge population. KDMC need to put more efforts to make the Swachh Bharat Mission as grand success. They need to publicize the objectives of SBM in all the sectors or areas. It should be the objective of each and every individual. The Swachh app is a step ahead to cleanliness drive. But, according to the citizens' response, it is not up to the mark. KDMC need to make this app more techno-friendly and it should provide quick response to the feedback uploaded.

The present study concludes that SBA campaign has had a positive impact on the overall growth of the nation. The Kalyan Dombivli citizens' perception is positive in terms of the implementation and growth of SBA. But some of them perceive that still more improvement and action is required. It should be the joint effort of government as well as the public. Without the effort and support of public, it may not be successful as a whole.

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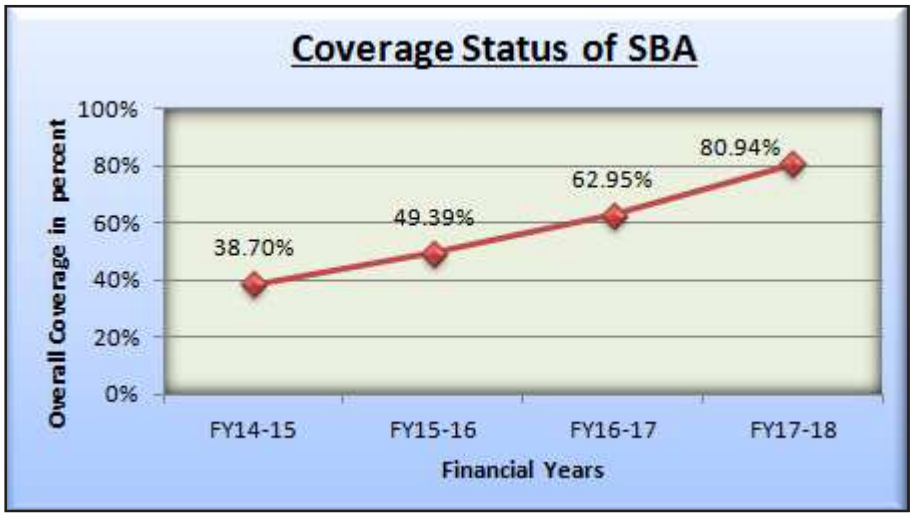
SBA Report:

SBA at Glance

Sr. No.	Toilet Reported	
1	Toilet built (in lakh) since 2 October 2014	676.29 (in lakhs)
2	Percent Increase in households with Toilet	42.24 percent (since 2 October 2014)
3	Toilet built in 2017-18	2,77,37,397
4	No. of Open Defection Free districts (Self-Declared)	363
5	No. of Open Defection Free Gram Panchayats (Self-Declared)	1,53,290
6	No. of Open Defection Free Villages (Self-Declared)	3,45,949
7	Photographs uploaded	508.23 (in lakh)

Source - SBM Reports, Swachh Bharat Mission – Gramin, Ministry of Drinking Water and Sanitation.



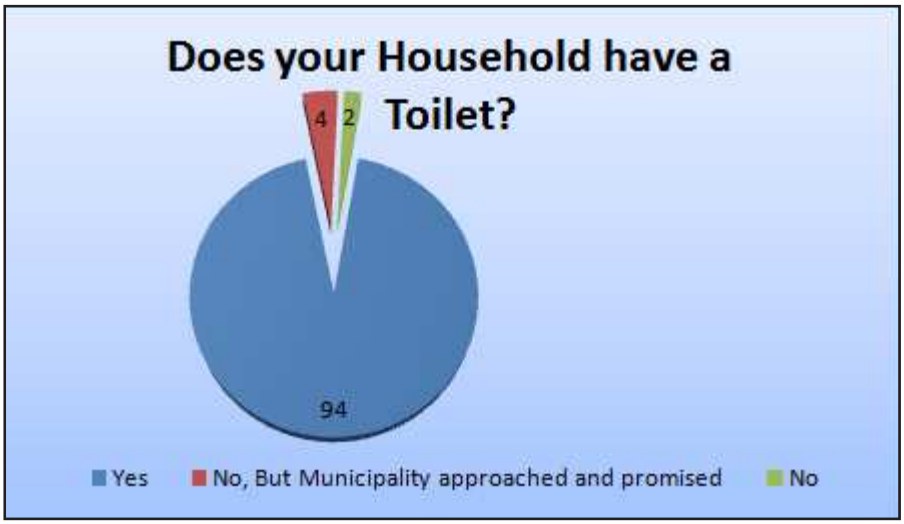
Source: SBM Reports, Swachh Bharat Mission – Gramin, Ministry of Drinking Water and Sanitation

Table No. 1

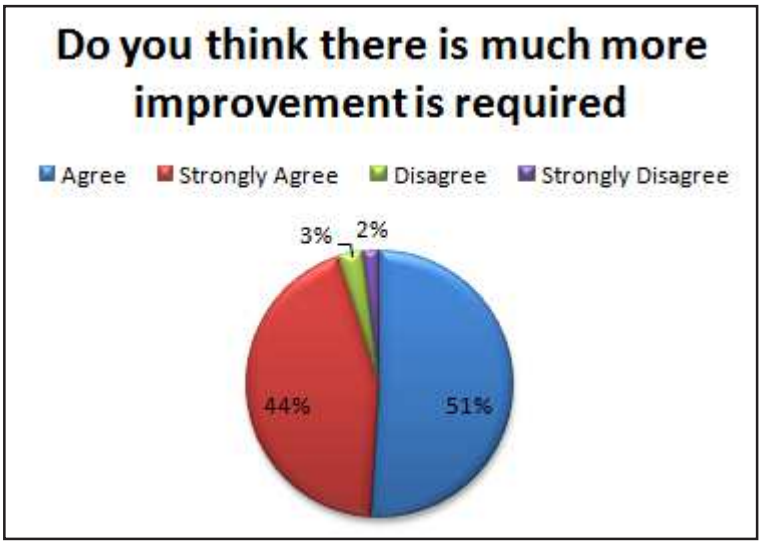
Questions	Yes (out of 100)	No (out of 100)
Are you aware of Swachh KDMC app introduced by KDMC?	72	28
Do you think the app is useful?	62	38
In your opinion, will it (SBA) change the outlook and habits of people?	83	17
Do you think your area is much cleaner than the previous years?	61	39
Do you agree that door-to-door collection of waste being done by KDMC properly?	57	43

Table No. 2

How do you see the Swachh Bharat Mission working in Kalyan Dombivli on a scale of 1-5 (1 is least and 5 is highest)	1 18	2 13	3 53	4 12	5 4
Do you find your area clean?	Always 10	Sometimes 64	Rarely 13	Never 13	
Are you able to easily locate dust bins available in your areas?	Always 31	Sometimes 31	Rarely 16	Never 22	



Graph 1



Graph 2

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An Investigation on Ecological Advancements in Airlines Sector

Harish Premrao Noula*

Abstract - This paper talks about innovations undertaken by various airlines to protect the environment. Innovations done by airlines is effective and sustainable in the long run of the aviation industry. The innovation will save fuel consumption of the aircraft and will help in lowering the CO_2 emission in the atmosphere. Biofuels can be used from which can be a new era in the field of aviation sector. As aircraft emeses a large amount of green house gases which harms the environment and result in global warming. Airlines prefer new upgrade versions of aircraft which are fuel efficient that lead to profitability. Airlines are trying to use biofuel instead of Aviation Turbine Fuel ATF. Wheeltug can be used to make taxing of the aircraft easier and fast without relying on pushback vehicles and ground staff. Aircraft manufacturing are doing research and development not only to upgrade the technology but also to manufacture aircrafts which are fuel efficient, light in weight that consume less fuel and which is more reliable. As the aviation market throughout the world is facing tough competition. ICAO in 2004 stated their objective is to diminish effect of aircraft of the neighbourhood air quality, lowering the individual influence by huge aircrafts commotion and diminish the effect of aviation on ozone harming substance on the worldwide atmosphere, so this innovation will be able to achieve ICAO objectives. This paper also talks about implementing various innovations undertaken by different airlines and aircraft manufacturers in Indian aviation industry.

Key Words - Airlines, Innovation, Biofuel, ATF and Wheel Tug.

Introduction - In a time of extraordinary rivalry and a testing domain encompassing the carrier business, organizations are looking for better approaches to pick up favorable position through advancement. Innovation and imagination are driving such advancements, which traverse over various classes, including seating, providing food, accommodation, themed encounters, registration encounters, solace, amusement and network. Different carriers and configuration organizations are at the bleeding edge of these improvements. A few carriers are considering ensuring nature by doing development in the Airlines Industry. Enhancing the ecological execution of aeronautics is a test ICAO considers important. In satisfying its duties, the organization built up a scope of guidelines, approaches and direction material for the use of incorporated measures to address flying machine clamor and emissions grasping innovative changes, working methodology, legitimate association of air activity, suitable airplane terminal and land-utilize arranging, and the utilization of market-based alternatives.

The majority of this has added to flying machine operations that today can be 70 percent more productive than in the 1970s.

In 2004, ICAO received three noteworthy natural objectives, to -

- Restrain or diminish the quantity of individuals influenced by huge flying machine commotion;
- Restrict or decrease the effect of aeronautic outflows on neighbourhood air quality; and
- Restrain or diminish the effect of avionics ozone harming substance emanations on the worldwide atmosphere.

The ICAO Council likewise received Strategic Objectives, with high need given to natural assurance, while the new Business Plan affirms the Organization's status as the main global association seeking after brought together and composed measures to decrease common flying's effect on the earth.

ICAO's exercises in the earth field are fundamentally centered around those issues that advantage most from a typical co-ordinated approach, on an overall premise, to be specific flying machine clamor and emissions. The greater part of this work is embraced through the ICAO Council's Committee on Aviation Environmental Protection (CAEP), which comprises Members and Observers from States, intergovernmental and non-legislative associations speaking to flight industry and natural interests.

Research Methodology-

Purpose Of The Research - The purpose of this research paper is to understand the impact of airlines industry on environment and to analyze the various innovations by airlines to protect the environment. Initiatives by the airlines

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and the aircraft manufacturing can be adopted by other airlines which can help to protect the environment in future.

objectives of the Research -

- To analyze innovations undertaken by the airlines to protect the environment.
- To study the impact of innovations undertaken by various airlines.

Methods of Data Collection - Secondary data was collected through various airlines and other websites.

Research Design - The research design deployed was exploratory research design. It is descriptive in nature.

Limitations of The Research - The research is based on secondary data due to physical and economic constraints.

Data Analysis Methods - Data is available from various airlines and other websites to generalize the findings and draw conclusions of the research study.

Findings -

United Airlines - United Airlines has unmistakably made it a need to create furthermore, seek after its own thorough condition and effectiveness objectives while additionally taking a lead in altogether impacting supportability in the general business carrier condition. United Airlines down to earth way to deal with natural activity, with objectives that are achievable, quantifiable, and which help take the whole business forward. United Airlines administration was likewise commended for proactively participating in environmental change and biofuels working gathering activities, committing time and assets to such associations as the IATA Climate Change Task Force and the Airlines for America (A4A) Condition Council, which United seats. It was this blend of can-do soul and assurance to walk-the-stroll on ecological activities that got the attention of the judges and made United Airlines a champion for its ecological and productivity tries. “This is a significant privilege for United and I’m pleased with the work that my collaborators do each day to be capable stewards for nature,” said Jeff Smisek, Director, President and CEO of United Airlines. “Our drives are paying off as we lessen United’s natural impression and co-operate toward a maintainable future for our organization and our industry.” United’s Eco-Skies program keeps up the organization’s dedication to the earth and incorporates moves made each day to make a reasonable future. United’s current natural accomplishments incorporate having more than 290 fuel-productive aircraft on arrange and being the US dispatch client for the Boeing 787, which accomplishes a 20 percent change in fuel productivity versus the air ship it is supplanting. The carrier likewise has 35 Airbus A35O-1OOOs on arrange, which will devour around 20 percent less fuel per situate than the widebody flying machine it will supplant.

United is on track to meet its 2013 objective to lessen fuel use by 85 million gallons and related carbon discharges by 828,750 metric tons. A year ago, the organization spared 83 million gallons of fuel because of armada substitution and fuel productivity activities, decreasing carbon discharges by 8,11,000 metric tons.

In June 2013, United Airlines reported a memorable organization with AltAir Fuels with consent to buy 15 million gallons of business scale and cost-focused propelled aeronautics biofuels for flights out of the aircraft’s Los Angeles center as ahead of schedule as 2014. United Airlines led the Midwest Aviation Sustainable Biofuel Initiative (MASBI) — an open/private cooperation of more than 40 broadly perceived associations concentrated on quickening the commercialization of cutting edge biofuels for avionics (2012).

United Airlines has additionally accomplished a few turning points with biofuels, counting the primary US business flight controlled by cutting edge biofuel in 2011; the main North American business carrier to work an exhibition flight utilizing engineered fuel produced using petroleum gas in 2010; and the primary North American transporter to perform a two-motor air ship flight exhibit utilizing practical biofuels in 2009. United has propelled the Sustainable Supply Chain (SSC) activity to better comprehend the ecological execution of its providers and develop associations with its key store network accomplices. The United Eco-Skies Community Grants program grants $50,000 to 10 non-benefits situated in its center point groups, for example, the Conservancy for Cuyahoga Valley National Stop and the Prince William Environmental Excellence Foundation, to advance engagement and volunteerism.

Airberlin - Bringing down fuel consumption and correspondingly carbon dioxide ($C0_2$) emanations have turned into the mantra of carriers overall looking to control costs and diminish the natural effect of their operations. Airberlin, Germany’s second-biggest carrier and Europe’s seventh-biggest as far as travelers conveyed, has taken an exhaustive way to deal with fuel proficiency that has made the carrier a worldwide model for eco-accommodating flying. In 2012, airberlin diminished fuel consume per 100 RPKs to 3.4 liters, the best among European system transporters. The carrier is not fulfilled, notwithstanding, planning to bring down fuel consume to 3 liters for every 100 RPKs by 2015. Airberlin credits a youthful air ship armada averaging five years in age and an in all cases way to deal with lessening fuel utilization for its operational proficiency.

Airberlin VP-performance Felix Genze said that “as it were 30 percent-35 percent of fuel utilization is in the hands of pilots. The rest is support, flight arranging, operations, dispatch, weight what’s more, balance and technical.” The airlines have thought of 55 measures offering the potential for rationing fuel. Its latest exertion, presented in January 2013, is a computer based “streamlined review device” created in organization with the Technical University of Berlin. The application is utilized to track and cure fuel-expending streamlined misfortune. It keeps running on a tablet-style gadget that can be snared to a console and screen, and uses streamlined misfortune information

sourced from Airbus what's more, Boeing. "We review flying machine for streamlined misfortune, for instance peeling paint," Genze said. "At that point we enter this information into the program, which quickly calculates and demonstrates the advantages of repairing the streamlined inadequacies that we have distinguished."

Airberlin is running the reviews on its air ship amid each A Check, with its whole 150-airplane armada anticipated that would be evaluated before the year's over, it expects the program will spare 2,100 huge amounts of fuel every year over the armada. Airberlin has also presented a voluntary 'fuel instructing' program for flight deck team to advance fuel-effectiveness mindfulness among its pilots. Other operational measures went for expanding productivity incorporate playing out a more noteworthy number of RNP accuracy approaches, streamlining flying machine load circulation what's more, fitting area lengths.

Qantas Group - Australia-based Qantas Group has long focused on installing natural execution and supportability standards inside all its administration frameworks, policies and rehearses. 'Ecological supportability is a directing principle for Qantas as a business it is a piece of our obligation to our customers, employees and the group', John Vaiastro, Qantas Head of Condition, said. "It is additionally a money related goal, given that our yearly fuel bill surpasses A$4 billion ($3.65 billion) and fuel represents 95 percent of our discharges. We plan to lead by example—through our fuel effectiveness and biofuel activities yet in addition to play a role in the industry discussions devoted to diminishing flying's effect on the condition.

Only through broad activity would aviation be able to really gain ground towards the objective of carbon-unbiased development from 2020." Qantas has a three-section Environmental Priority bundle. The initial segment is the Direct Greenhouse Gas Emissions approaches that include fuel productivity, sustainable flight fuel, fleet restoration what's more, carbon balance. The carrier worked its first bio fuel fights, a Sydney-Adelaide Airbus A33O, got from cooking oil, split 50:50 with traditional fly fuel. Delivered by SkyNRG, it has been completely confirmed what's more, embraced by the World Wildlife Fund. Its 'lifecycle' carbon impression is around 60 percent lesser than that of regular fly fuel. Qantas reports that reviews demonstrate this industry could produce 20,000 occupations and diminishing ozone harming substance discharges by 17 percent in the aeronautics area throughout the following 20 years.

The normal age of Qantas' fleet of 280 aircraft is 8.3 years, it is persistently redesigning with more fuel-effective transports. In fleet reestablishment, Qantas has 78 A320neo flying machine on arrange with CFM International LEAP IA motors. The A320neos have around a 15 percent lower fuel consumed over current A32Os. Notwithstanding the A320s, Qantas has 15 Boeing Dreamliners on arrange and has taken conveyance of 12 of a request of 20 Airbus A380s. Qn provincial courses, the Group have put resources into Bombardier Q400s, which devour 35 percent less fuel than comparative measured flying machine. The Group has actualized fuel-effectiveness enhancements counting enhanced fight techniques and improved flight planning; RNP at 18 goals inside Australia and New Zealand what's more, is proceeding with decrease in locally available auxiliary control units by supplanting them with ground control leads. Qantas Group is a signatory individual from the Sustainable Aviation Fuel Users Group (SAFUG), a gathering of aircrafts and aeronautics organizations working with logical offices and ecological non-government associations to quicken the commercialization of Sustainable Aviation Fuel.

The second piece of its Environmental Priority bundle is Utilities and Resources, including power, water and waste. The Qantas Group has joined forces with Closed Loop Recycling, presenting arrangements, for example, washable utensils and 35 percent reused paper containers, and less bundling. The third need is commotion and incorporates the group. Qantas is a defender of GPS-based Smart Tracking, which has been utilized at Canberra Airport to update flight ways to move clamor far from occupants living close to the airplane terminal.

Air Canada & Airbus - The Air Canada and Airbus BioFuelNet Canada partnership will survey Canadian answers for the generation of maintainable option fly energizes with the long-haul objective of providing Air Canada. The task, facilitated by Montreal's McGill University, will ponder distinctive procedures and crude materials accessible for elective fuel creation. Moreover, it will investigate imaginative new pathways furthermore, the general supportability of arrangements.

The organization was reported in May; the main appraisal is normal before the finish of 2013. Air Canada has worked two flights with biofuel and on each event considerably lessened its outflows. New innovations, for example, elective fills, are one of the ways the carrier business intends to diminish its outflows to meet its focus of carbon-nonpartisan development for 2020 and past. Flying biofuels are a standout amongst the most encouraging approaches to diminish the flying business' carbon impression, influencing air to travel more earth cordial. Airbus is a key player in the field, committed to finding the most reasonable fuel hotspots for the eventual fate of air travel. This partnership between Airbus, Air Canada and BioFuel Net Canada will guarantee arrangements are maintainable, reasonable and in fact appropriate for all flying machine. In June 2012, Airbus and Air Canada performed North America's first "Flawless Flight" over worldwide outskirts, cutting $C0_2$ discharges by over 40 percent contrasted with a normal flight. The business flight with travelers from Toronto, Canada to Mexico City, consolidated present day airplane innovation, maintainable elective powers, streamlined Air Traffic Management and best hone operations, for example, single-motor taxing

Wheeltug - WheelTug's electric drive framework—two

ultrahigh- torque electric engines introduced in the nose adapt wheels of an aircraft, a motor drive gadgets bundle and cockpit controls - gives full aircraft versatility on the ground without the utilization of fly motors for ground navigating or tow-pulls for pushback from terminal entryways.

By using an airplane's Auxiliary Power Unit (APU) - which normally air conditions the aircraft and starts its engines - the WheelTug unit requires only four pounds of fuel for every moment, in appear differently in relation to the navigating fuel-consume found in narrowbody flying machine (approximately17 Ibs/min amid single-motor navigating; approximately 25 Ibs/min amid double engine taxiing). Basic estimations detail the distinction WheelTug can make. For instance, a single 30-minute taxi out of London Heathrow can consume 510 pounds of fuel. At $4 per gallon, a single aircraft's taxi will along these lines consume over $2,000 in fuel. Increase that by the majority of a bearer's Heathrow flights in one day and the investment funds turn out to be clear.

WheelTug gauges the framework can spare carriers up to $1.1 million per aircraft, every year. Likewise, critical to consider is the lessening in carbon dioxide what's more, other ozone harming substance outflows coming about because of a flying machine's principle motors having been shut down amid both the taxi to the runway before departure, and the navigate to the terminal after landing. The WheelTug, and the general idea of "E-Taxiing," demonstrates a pragmatic route forward to acknowledging noteworthy lessening of aircraft contaminations. WheelTug is headed toward making these efficiencies in fuel-utilize, time-administration, activity change, ground-team work wellbeing and natural reclamation a reality.

The evidence is in the client list, which by June 2013 checked 573 conveyance spaces saved by 11 aircrafts from Europe, America, the Middle East and the Far East. By utilizing a plan of action that makes advantages of the framework quantifiable, and by renting the greater part of its frameworks specifically to carriers and flying machine renting organizations as a byproduct of a rate of the concurred investment funds, WheelTug has jumped to the front line of the E-Taxi movement.

Conclusion - Innovations done by the various airlines can protect the environment. These innovations are effective, efficient and sustainable, which can help the airlines industry in future. Airlines all over the world can actualize this innovation, which can enable them to reduce fuel cost, due to which the airlines can earn procure profit. WheelTug technology can be used so that the movement of aircraft on the ground can be fast and the aircraft don't have to rely on pushback vehicles.

Recommendations -

- Most of the commercial airlines in India use Airbus and Boeing manufactured aircrafts. Indian aviation industry can implement these technologies which will be beneficiary for them as the fuel prices in India are very high
- United Airlines and Air Canada are members of Star Alliance and Air India is also a member of Star Alliance, so United Airlines and Air Canada can help Air India in implementing the innovation.
- Jet Airways have recently leased WheelTug system for Boeing-737NG aircraft in similar ways other airlines of India can use WheelTug system. WheelTug system helps the busy airlines industry in India for fast and smooth working as which result in on time departure of the flights.

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Corporate Social Responsibility and Sustainable Development

Trupti Shelke*

Abstract - CSR is what business does over and above its statutory obligations. Society and business are complementary to each other in their goal for sustainable development. One cannot thrive without the other. Hence, business has a moral responsibility to contribute in enhancing larger social good. The main aim of this research paper is to analyze and understand the role of corporate social responsibility in the overall scenario of sustainable development and inclusive growth. Further, this paper will also analyze the contribution of various Indian organizations for social upliftment. The present paper will illustrate the present status of organizations in India with regard to their compliance to social responsibility and ethical practices. To overcome the challenges found during the implementation of CSR, few suggestions have been delineated.

Keywords - Corporate Social Responsibility (CSR), Green ecology, ICICI, welfare.

Introduction - As a mode of implementing human rights, labour and environmental standards, Corporate Social Responsibility (CSR) have long been discussed as a possible remedy to the inequalities created and exacerbated by economic liberalization and globalization. It considers that a corporation is not just a self-centred profit-making entity but that the company and its actions are also integral to the economy, society and environment in which they operate **(Herrman, 2004)**. In contemporary socio-economic scenario, the concept of CSR has become widely integrated with business ethics in all parts of the world. The need for CSR is even more urgent in developing countries where economic disparities are more pronounced and both ecology and society are even more vulnerable to human induced environmental hazards. India is a country of magnificent contradictions. The country is widely inflicted with baffling economic disparity among urban, semi-urban and rural populace. Market based economic practices have further widened the scope of inequalities in the country. The emerging business culture of profit and competition has more and more marginalized social welfare issues such as health, education and social security for the vulnerable sections of the society into merely a peripheral pursuit. Given that, the government of India along with active civil society participation has tried to create a sense of business ethics and responsibility among the corporate both by legal and ideological means. There are many instances where corporates have played a dominant role in addressing issues of education, health, environment and livelihoods through their corporate social responsibility interventions across the country. Private business enterprises like, Tata, Birla and Reliance are practicing the CSR for decades, long before CSR emerged as a norm to develop a culture of social welfare and environmental sustainability among the leading economic giants of the country.

Objectives -

- Make a critical analysis of the concept of corporate social responsibility.
- To analyze CSR in the Indian scenario.
- To explore the areas of CSR in which the companies are involved.
- To study the challenges of implementing CSR and make recommendations for effective implementation

Research Methodology - The research proposes to use qualitative research tools to empirically support the arguments of this research paper that successful companies in India do value social responsibility. The researcher has adopted the doctrinal method in order to study the development of CSR in the Indian context and would further adopt empirical research to find out whether successful companies in India value social responsibility and standards of ethics.

Limitations -

- Time constraints;
- Non accessibility to information held by various organizations.
- Non-availability of information in many cases.

Corporate Social Responsibility In India - Tata honcho Ratan Tata emphatically stated, 'We do not do it for propaganda; we do not do it for publicity.'According to Narayana Murthy, the Infosys chief, social responsibility is to create maximum shareholders working under the

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circumstances, where it is fair to all its stakeholders, workers, consumers, the community, government and the environment.

Subrata Mukherjee the President of ICICI foundation declared: 'CSR needs to be embedded into the core of the business strategy'.

Contribution of Various Companies - There are various companies in India engaged in CSR activities. Companies engaged in CSR mainly focus on the following areas:

Upliftment of Society - Various organizations in India are raising funds, joining and supporting NGOs for upliftment of society like HDFC, ICICI, and Jet Airways.

Concern for Health and Society - Awareness is being generated in the society for positive and good health by improving access to medicine for poor people in rural areas for various epidemic diseases like HIV/AIDS. Various organizations like NTPC, Amway, Novartis, Modicare, and Oxfam are generating awareness successfully.

Child and Women Welfare - Children are the backbone of any nation. Various organizations are helping schools in slum and supporting socially backward women and also sponsoring various women and children upliftment projects. Organizations like Wipro, NIIT, Hindustan Pencils Ltd. are few among them.

Green Ecology - Environment plays an important role in society. It is the duty of every citizen to protect the environment. Various kinds of toxic gases, waste production, and water contamination are some of the issues on which organizations like Sony, Panasonic, Orchid hotels are focusing.

Development of Rural areas - Various organizations are focusing on the overall development of adjoining villages around their plants. Various facilities like good educational infrastructure, hospitals etc. in villages have been developed by various organizations like Bajaj Auto, ONGC, etc.

Employees' Welfare - Employees are the backbone of every organization. Every organization wants that their employees should be fully satisfied to enjoy the environment in which they work and live. Various international human rights and employees' welfare programmes are a few examples of CSR.

New Trends in CSR Activities - In India, various organizations are following charity- based philanthropic social initiative- based CSR approach. However in a globalised era, Indian CSR should focus beyond health and education schemes. Companies should work for propagating renewable sources of energy. The acute problem of power shortage can be overcome by encouraging renewable resources. Pollution is another focus area. Pollution damages human health as well as plant life. Organizations should take initiative to address this problem. Since industrialization has caused proliferation of fragile eco-system, companies should focus on creating and sustaining bio- diversity. Various organizations through CSR should focus on protecting the bio-diversity so that the variety of plant & animal life can be preserved. Few other areas like poverty alleviation, infrastructure development along with education, health and environment should also be the focus areas of CSR.

Challenges to Implement CSR - The biggest challenge of CSR is that the corporate sector should have a holistic approach and it can no longer be confined to its financial concerns alone but should also address concerns of the society and environment at large. Due to lack of awareness, various organizations have accepted CSR activities in a narrow perspective and there is a general apathy in pursuing CSR activities. Lack of specific areas of focus and concomitant rules and regulations is one of the most important challenges in implementing CSR effectively.

suggestions for Effective Implementation of CSR

- Every organization should decide minimum annual expenditure for CSR activities. In order to ensure inclusive growth, envisaged in our Plan Vision document, rural areas should get priority over urban areas in the matter of getting returns from CSR activities.
- Public and private partnership can also be a better tool for effective implementation of CSR activities.

Conclusion - The concept of CSR is not new, rather it started during 1950s in India. Various authors and organizations have defined this concept but still a suitable and consensual definition of CSR is awaited.

CSR in India is known due to the efforts of Tata group of companies. Nowadays galaxy of organizations is following CSR activities. However, there is different point of view regarding CSR. In the present scenario, CSR is practiced for social causes, healthcare, education, infrastructure development, women empowerment, community development, political empowerment and national heritage. However, there are certain areas which are untouched. In today's globalised era, new trends of CSR like generation of electricity, containing and checking pollution, bio- diversity production should be encouraged. CSR is the need of the hour to bring changes in the current situation to put socio- economic development in India on a fast track.

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Impact of Climate Change on Health

Supriya Yadav * K. Saravanan Nadar **

Abstract - The Earth's climate has changed throughout history. Just in the last 6, 50,000 years, there have been seven cycles of glacial advance and retreat with the abrupt end of the last ice age about 7,000 years marking the beginning of the modern climate era and of human civilization. Most of these climate changes are attributed to very small variations in Earth's orbit that changes the amount of solar energy our planet receives.
This article discusses the effects of climate change on health of living organisms. Sudden variations in temperature have led to increasing diseases. Here the main problem is that we ignore the causes of these changes as we are only focusing on the materialistic world and ignore the values which should be given priority.
Key Words - Glacial advance Climate change disease.

Introduction - Till date we have launched different satellites into space to improve the technology in our day to day life communication and to study the climate change and its own impact on different parts of earth. All this data is being shared by those satellites to the research space centre in Earth where they relate the current problems and predict the upcoming events and disaster.
Some are the observation due to climate change:

- Earth's average surface temperature is rising tremendously to be precise 2^0F (1.1^0C) the main cause for it is carbon dioxide and other harmful emissions emitted by human being activities.
- **Ocean Warming -** Earth's 70 percent of the part is hydrosphere. The Ocean warming also causes glaciers to meltdown which in turn cause increase in sea levels and submerging of lithosphere.

The study of climate change is important today due to its impact on everyday life of human beings. The Climate changes are natural but are making it worse due to never ending human wants.

Methodology-

Secondary data from various economic journals and websites, blogs etc. has been used for our study.

Climate change has impact on both ecology and economy.

Climate change is variation in the regular climatic cycle. As it disturbs the life on earth it also indirectly disturbs the economy.

This paper narrows down the focus on the impact of climate change on health. We all witness minor health issues during a slight change in the climate. When there is a major deviation in the climate, it has a negative impact on our health.

Changes in greenhouse gases and other drivers alter the global climate and bring about myriad human health consequences. Climate change causes environmental consequences such as floods, droughts, heat waves, intense hurricanes and degraded air quality. All these affect physical, social and psychological health of human beings either directly or indirectly. Climate change can be driver of disease migration as well as exacerbate health effects resulting from the release of toxic air pollutants in vulnerable population such as children, the elderly and those with asthma and cardiovascular disease.

Deviation in the climate gives rise to several diseases such as cough and cold, headache, sun stroke, mild fever. The more serious ones include tuberculosis, malaria, and swine flu.

Asthma, respiratory allergies and airway diseases - Increased ground level ozone and concentration of fine particles triggers coughing, chest pain, throat irritation and congestion as well as reduces lung function causing lung inflammation. Increase of carbon dioxide concentrations and increased temperature affects the aeroallergen distribution which causes allergenicity of pollen and mould spores.

Cancer - Volatilization of chemical is caused due to increase in temperature, which accelerates the cause of cancer. Depletion of stratospheric ozone layer causes exposure to UV rays and temperature causing skin cancer and

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cataracts. A decline in air quality and rise in concentration of certain air pollutants increase the risk of cancer.

Cardiovascular disease and stroke - Extreme cold and extreme heat causes heart related disorders and diseases such as dysrhythmias and heart stroke. Increased ozone layer caused by rise in temperature leads to troubles in pulmonary gas exchange and causes stress on heart. Stress and anxiety are experienced due to sudden change in climate. The human body does not easily adapt to change which leads to stress, cardiovascular ailments, stroke, depressions, sudden cardiac deaths.

Effect of heat - Prolonged exposure to heat can cause heat exhaustion, heat cramp, heat stroke and deaths and exacerbate pre-existing chronic diseases. High concentration of buildings causes heat islands effect making urban area warmer than surrounding areas.

Food borne diseases and nutrition - Nutritious food is a basic necessity of life. If proper calories, macro nutrients and macro nutrients are not made available it will cause illness. Extreme weather changes cause destruction of crops and thus there is shortage of various types of food grains, vegetables and fruits.

Human development effects - Environment can be a powerful modifier of human development. Exposure to extreme heat, metals such as lead can cause changes in puberty, birth defects, foetal loss, reduction in IQ, disruption in normal body development.

Mental health and stress related disorders - Climate influences physical as well as psychological health. Changes in weather can cause irritability, mood swings, depressions, frustrations. If physical health is affected it also affects the mental health of a person.

Causes of Climate Change -

Top of Form - Humans are increasingly influencing the climate and the earth's temperature by burning fossil fuels, cutting down rainforests and farming livestock.

This adds enormous amounts of greenhouse gases to those naturally occurring in the atmosphere, increasing the greenhouse effect and global warming.

Green House effect - Some gases in the Earth's atmosphere act a bit like the glass in a greenhouse, trapping the sun's heat and stopping it from leaking back into space. Many of these gases occur naturally, but human activity is increasing the concentrations of some of them in the atmosphere, in particular:

- carbon dioxide (CO_2)
- methane
- nitrous oxide
- fluorinated gases

CO_2 is the greenhouse gas most commonly produced by human activities and it is responsible for 64 percent of man-made global warming. Its concentration in the atmosphere is currently 40 percent higher than it was when industrialisation began.

Other greenhouse gases are emitted in smaller quantities, but they trap heat far more effectively than CO_2, and in some cases are thousands of times stronger. Methane is responsible for 17 percent of man-made global warming whereas nitrous oxide for 6 percent.

Causes for rising emissions -

- Burning coal, oil and gas produces carbon dioxide and nitrous oxide.
- Cutting down forests (deforestation). Trees help to regulate the climate by absorbing CO_2 from the atmosphere. So when they are cut down, the beneficial effect is lost and the carbon stored in the trees is released into the atmosphere, adding to the greenhouse effect.
- Increasing livestock farming. Cows and sheep produce large amounts of methane when they digest their food.
- Fertilisers containing nitrogen produce nitrous oxide emissions.
- Fluorinated gases produce a very strong warming effect, up to 23 000 times greater than CO_2. Thankfully these are released in smaller quantities and are being phased down by EU regulation.

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A Study of Smart Cities

Vijeta V. Ashrit*

Abstract - 'A smart sustainable city is an innovative city that uses information technologies and other means to improve quality of life, efficiency of urban operation and services and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects.'
It is an effort to define the smartness of the cities in 3 flavors. 1. Smart cities are learning to learn. 2. Smart cites are learning how to use Information on Communication and Technology (ICT) to make city system more efficient, equitable and resilient. 3. Smart cities are gaining new awareness about the important role that they can play on global issues like global warming. Referring to the need for urbanization and trends suggesting India as an urban majority city in coming future, India's 100 smart cities plan should be seen as an attempt to create urban infrastructure in anticipation of the deluge.
Key Words - Smart City, ICT, utilities, high technology, economic growth.

Introduction - Smart city development/projects are booming international phenomena. The word 'smart city' was originated in 1998 and the first funding for smart city was organized in the year 2000. The six dimensions of smart city are smart economy, smart mobility, smart environment, smart people, smart living and smart governance. Every city can become smarter by focusing on any of the mentioned dimensions. Smart city is a community that is efficient, livable and sustainable. Smart cities are compatible in controlling the rapid urbanization and various other problems caused by ever increasing population. The objective of smart cities is to reduce the challenges that cities face like scarcity of utilities, housing, healthcare and much needed infrastructure like transportation, schooling, sports and roads. The Price instability, climate change, economic opportunities and social benefits to its citizens is taken care of by smart cities. In the above context, smart cities and smart city projects are being focused as holistic approach towards better city planning. It is a pet project of the government making cities better and need to leapfrog towards improving cities to a level where they deliver a quality of life that people are demanding for as a right to live. Subsequently, the advancement in ICT and its applications in smart cities created better opportunities and tools to understand communicate and predict urban functions.

Objectives

- To understand the needs of citizens.
- To recognize the weak areas of existing cities that need most consideration for development.
- To analyze and strengthen the local government bodies financially and technically for effective implementation.
- To find solutions for better governance using advanced ICT and digitalization technology.

Research Methodology - The study is based on secondary information which is conceptual. The literature required for the study has been collected from various reports, journals, magazines, publications, books, websites and other related sources.

Benefits of Smart cities - Well-designed technology tools help government agencies to improve the efficiency of city services, by eliminating redundancies, finding ways to save money and streamlining worker's responsibilities.

- Government agencies' Smart Cities Mission is to drive economic growth and improve the quality of life of people. Local area development and harnessing technology are focused and enhanced by Government agencies to create smart outcomes from citizens.
- Smart cities provide citizens with advanced facilities like excellent mobility, electricity through smart grid, advanced applications, better city governance, digitization and other solutions.
- Smart cities reduce pollution and provide green environment to its citizen by energy saving and paperless communication etc.
- Smart city is the new initiative dimension of Urban center that leverages the power of Information Technology to improve quality of life, enhances economic development, manage and use natural resources in an efficient manner.
- Innovations in IOT (Internet of Things) is playing a major role and providing insight knowledge to agencies in developing smart cities. Cities will become smarter by :

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a. Developing strategies to plan for long term growth
b. Creating more energy efficient environment
c. Improving their infrastructure and
d. Keeping citizens safe.

- Smart cities are operationally efficient. The asset tracking system tracks the location of city assets such as utility vehicles, containers or buses and raises alerts when unexpected events occur.
- Smart cities can reduce energy consumption and greenhouse gas emissions and improve waste management.

Factors of Smart Cities - The government agencies of India have focused its attention on urbanization imperatives and initiated the concept of smart cities in India. Rejuvenation of heritage sites and hundred smart cities, to be both Greenfield and Brownfield are in the first phase of smart cities mission. The factors of successful smart cities are as below.

- **Information, Communication and Technology:** ICT is one of the important planks. The use of integrated technology platform that are easily assessable across various devices is key in providing access, transparency, speed, participation and payback in public services.
- **Efficient Utilities:** Smart meters, renewable energy, energy conservation, water harvesting, effluent recycling, scientific solid waste disposal method are hallmarks of smart cities.
- **Meaningful PPPs:** Public-Private Partnerships are used as sources for efficient delivery of utilities with agreed services level standard. The range of services provided through PPPs range from health care to street lighting.
- **Safety and Security:** This aspect is high in public consciousness especially regarding safety of women, road rage, robbery, attacks on the elderly and juvenile delinquency. Network of CCTV video cameras brightly lit public areas, intensive patrolling and surveillance, identity-verified asses and rapid response to emergency calls.
- **Financial Sustainability:** The local bodies enjoy financial sustainability to take charge of their own destinies, vide the 74th amendment to Constitution (1992). Further, the government agencies are free to execute projects through PPPs.
- **Citizen-Participative Local Government:** The local issues need careful designing of electoral and participative governance through enthusiastic involvement of citizen in local body.
- **Sufficient Social Capital:** Smart cities cannot be devoid of the appropriate levels of social infrastructure like schools, hospitals, public spaces, sporting and recreational grounds and retails and entertainment avenues.
- **Transit-Oriented Habits:** Smart cities aim providing one of the major expectations of citizens i.e. dream solution of every citizen for walk to work. Conveniently networked public transportation with first and last mile connectivity in place reduces the use of personal vehicles and motivates the use of electric cars and bicycles paths.
- **Green Features :** Smart cites aim towards minimizing carbon footprints and becoming eco-friendly. As a green features park and verdant open spaces, absence of pollution, use of renewable, conservations and recycling are mandatory in development of smart cities.

Challenges in Developing and Implementing Smart Cities - The smart cities mission objective is to promote cities that provide core infrastructure, clean and sustainable environment, applications of smart solutions and offer quality of life to its citizens. It is recognized that smart cities are engines of economic growth and are drawing a million people every minute from rural areas. The challenges that government agencies face during development of smart cities are as follows.

- **Retrofitting Existing Legacy of City Infrastructure to make it Smart:** The weak areas of the existing city are to be determined and have to be considered for development on a priority basis. The integration of formerly isolated legacy system to achieve city wide efficiencies can be a significant challenge.
- **Financing Smart Cities:** The projects of smart cities need to be financed till completion through complete private investment and or through PPPs.
- **Availability of Master Plan or City Development Plan:** It is necessary to have a master plan or a city development plan which is the key to smart city planning, implementation and encapsulation. Most of our cities do not have master plan or a city development plan which needs to be updated first.
- **Financial Sustainability and Technical Constraint of Urban Local Bodies:** Most of the urban local bodies are not financially sustainable. If additional investments are recovered in a phased manner, inadequate cost recovery will lead to continued financial losses. Many of the local bodies have limited technical capacities to ensure timely and cost effective implementation and subsequent operations of smart cities. The Government needs to see that the technical support and funding is provided to the local bodies to make the city smart.
- **Three Tier Governance:** Successful implementation of smart city solutions need effective coordination between various institutions providing musical amenities as well as effective coordination between central, state and local government agencies on various issues related to financing, sharing and service delivery processes.
- **Dealing With a Multivendor Environment:** The ability to handle complex combinations of smart city solutions developed by multiple technology vendors.
- **Reliability of Utility Services:** It is essential to focus

on reliability of utility services such as electricity, water, telephone or broadband services. Cities need to shift towards renewable sources and focus on green buildings and green transport to reduce the need for electricity.

Smart Cities, the Future of Living in India - Smart cities mission in one of the Prime Minister's pet project. The government has embarked on smart city mission and has identified a list of 98 current cities to be developed into smart cities. The purpose of this mission is to promote economic growth and improve the quality of life of its citizens. For this, the government plans to enable local area development by using digital technology and information and communication technology. The green field areas are developed in the periphery of the cities to provide accommodation to the anticipated growth of the population. Smart cities will use technology to gather and correlate information and data by using smart solutions with the aim of improving the services and infrastructure. The information gathered will be in real time there by providing quicker solutions to problems on hand. As a result, the quality of life improves creating a feel good factor for the individual. This leads to higher productivity, employment opportunities and income generation and consequently inclusive growth.

Conclusion - Smart Cities development is to understand the need of the people and to provide healthy living environment, economic growth, mobility, infrastructure, reliable utilities and services, safety and security, digitalization and Information Technology etc. to its citizens. The development of smart cities shall enhance the lifestyle of its citizens and is compatible with accommodating the anticipated growth of urban population.

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Profit Maximization Vs Sustainable Development Paradox - A Study on Efforts of Select Indian Companies that are successfully resolving the paradox

Dr. Smita Shukla*

Abstract - Both the management theory as well as the micro-economic theory suggest that goal of a firm operating in any market is maximization of profit. Alternate objectives of a firm that are discussed in management theory can also be - Sales maximization, shareholders' wealth maximization, satisficing various stakeholders etc. Sustainable growth and development is not discussed as a goal of a firm. The competitive markets force companies to focus on cost cutting and sales maximization instead of focussing on sustainable development as it involves additional investment and operating expenses.

In nutshell there is a paradox between goal of 'profit maximization vis-à-vis sustainable development and growth attainment'. In this context it important to recognize efforts of select market driven companies that like other companies are focusing on enhancement of profit however this profit is based on business idea having its roots in concept of sustainable development. This paper discusses the contribution of such select companies in saving the environment and creating sustainable development while pursuing the goal of profit maximization.

Introduction - We recognize our dependence on the earth's resources – its water, oxygen and other natural elements. However, there is negative connection between the growth of an economy and the growth of cleaner and greener earth. Business and economic growth should ideally focus on three 'Ps' – People, Planet and Profit. Unfortunately growth examples world-wide barring few suggest that the co-existence of 'People, Planet and Profit' together is difficult.

Business organization and governments across the world assume that more the business and industry grows more is the growth of a nation as industrial growth leads to more jobs being created,creation of more material resources and improvement in materialistic quality of life. In this growth process nature and natural resources are taken for granted and damage to nature is ignored in view of short term gains (read – profit maximization). However, now recognition is creeping in that mindless pursuit of materialistic short-term goals results in unmanageable long term cost in form of degradation and destruction of natural resources and wealth that is being lost forever.

CSR programs undertaken by several companies in India suggest that Companies have started thinking about the negative impact of business growth on environment and hence they are striving to become responsible corporations by thinking of ways and means to grow while protecting the environment.

Data analyzed by the ministry of corporate affairs for CSR expenditure of all Indian companies in 2014-15 exhibits that 14 percent (Rs. 1,213 crore) of total CSR spending in India was made on activities focusing on conserving the environment. Environment Conservation was the third highest expenditure on social impact issues after education (32 percent) and health (26 percent) by Corporate India.

In this context it important to recognize efforts of select market driven companies that like other profit seeking companies are focusing on enhancement of profit however this profit is based on business idea having its roots in concept of sustainable development.

Companies successfully joining – People, Planet and Profit - Companies in Re-cycling Business:

In last one and a half decades several companies / organizations have emerged that are focussing on such sustainable projects or business ideas that create value for People, Planet as well as Business. These companies are in actively building business in space waste management and recycling.

Texool - Texool is a company based in Mumbai. The Company uses discarded textiles from wealthy (developed) countries and recycles them into shopping bags, backpacks, and handbags.In doing so, Jaideep (CEO) and his team is not only reaping good profit, but also creating job opportunities in India, and helping the environment.The venture produces about 15 lakh bags every year. The price of these bags varies from Rs 20 to Rs 400. The company is creating designer shopping bags, handbags, school bags,

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bottle bags etc. Most of these bags have clever tag saying 'I am not virgin' indicating that bag is made of re-cycled Textile. Texool currently employs sixty people in Mumbai.

Pure Waste - Cotton is a water-intensive crop and can be destructive for the soil as sowing of Cotton saps the soil of important minerals and materials. Further, as cotton is a cash crop and not a food crop, it also takes away precious resources and arable land, which otherwise could have been used to feed many. Unfortunately, the primary fabric used in t-shirts, and other clothing is cotton. In the process of Cotton textile making and selling on an average about 10 to 15 percent of fabric goes in the trash.

'Pure Waste', Finnish Company, uses this fabric trash by breaking it down to fibers and re-knitting it into fibers once again. Then the fibers are spun and are turned into a new fabric material. Given that the earlier fabric material was already dyed such recycling eliminates wasteful step in manufacturing fabric/clothing and that is dying of the fabric material. Jukka Pesola and Anders Bengs the promoters of the company insist on highlighting that they are not doing recycling but 'purecycling' as they are taking leftover fabric and turning it into new and usable piece of clothing. According to Pesola 95% of textile fibers can be recycled. 'Pure Waste' has recently established its new unit in Tamil Nadu as Tamil Nadu is heart of India's textile industry.

Shakti Plastics - The Shakti Plastic Industries is an all-rounder in the field of manufacturing reprocessed plastic granules. The company is based in Mumbai and was established in 1969. The company has over 45 years of experience in the field of recycling all types of plastic granules.The chemical properties of the recycled granules created by the company are equivalent to as well as cheaper than the virgin plastic. The company is also trying to Promote quality collection and sorting of plastics as it believes in philosophy that used plastic should not be discriminated against and each residential and commercial facility should have a dedicated bin in order to allow collection of good quality plastic. The Company also believes that collection and sorting at source can be improved by increasing local capacity and consumer awareness.

Arora Fibers - Arora Fibers Ltd has been recycling discarded plastic bottles into polyester staple fiber since 1994. Arora fibers Ltd. was incorporated in October 1993 in Ahmedabad, Gujarat and was promoted by Mr. Dilawar Singh Arora and his son Rupinder Singh Arora. The company entered into a technical collaboration with Mijung Industries, Korea, for technical assistance to manufacture polyester staple fiber from plastic waste. The Commercial production commenced in May 1995 and Arora Fibers became Pioneers in their field in India. The products manufactured by the company find wide usage. Polyester staple fiber is used in a wide array of industries — spinning, non-woven, felts, needle punching, carpet yarns, upholstery and hosiery. They are also used as fiber-fill in blankets, quilts, pillows, mattresses, stuffed toys, garments, etc. Nylon chips are widely used in mechanical and electrical components, household appliances, portable power tools, engineering plastics, etc. The company has indentified potential customers in the US and Europe through its overseas trading contacts as well. The company is a publicly listed company.

Companies successfully joining – People, Planet and Profit - Companies in Waste Management Business:

Solid waste that we human discard is present all around us. An individual produces an average of 0.8 kg/ waste/ person daily. As per World Bank data the amount of Solid Waste generated per capita per day varies from region to region as is dependent on level of development of an economy and affluence. Following is the data on quantity of solid waste generated per capita per day (region wise) across the world:

Table 1: Region wise waste generated per capita per day

Region	**Sold Waste (Kg/Capita/Day)**
AFR (Africa)	0.65
EAP (East Asia Pacific)	0.95
ECA (Europe and Central Asia)	1.1
LAC (Latin American and Caribbean)	1.1
MENA (Middle East and North Africa)	1.1
OECD (Organization of Economic	2.2
Cooperation and Development) SAR (South Asia)	0.45
Source: World Bank – 2014	

Solid waste is the unwanted or useless solid materials generated from human activities in residential, industrial or commercial areas. It may be categorized in multiple ways – That is on the basis of origin/content/ hazard potential.

1. origin (domestic, industrial, commercial, construction or institutional)
2. contents (organic material, glass, metal, plastic paper etc)
3. Hazard potential (toxic, non-toxin, flammable, radioactive, infectious etc).

Ministry of Urban Development in its manual on solid waste management (year 2000) had estimated waste generation of 100,000 per day. As per recent data shared by Housing and Urban Affairs Ministry, 1.43 lakh tones per day of solid waste generated in India (2018) and only about 33,800 tpd (or 23.73%) was being processed.

Solid Waste management is critical for future of earth as it reduces the quantum of harmful effects that waste can have on human life and environment. Some companies that have successfully made Waste management their business are as follows:

Sahhas - Sahhas is an on-site waste management service company that is offering its services to technology and business parks, corporate, educational campuses and housing complexes. The company is active in Bangalore and Chennai and its clients include companies like Microsoft, General Electric, Shell, Texas Instruments and even Indian Institute of Management Bangalore. William

Rodrigues, founder of Sahhas, emphasizes on importance of bringing back consumer waste into recycling chain. The waste material is collected, sorted, compacted in a material recovery facility, and transported to respective recyclers. Currently the company is managing around 25 tons of waste per day and wishes to scale up to over 300 tons of waste management in next four to five years. Sahaas is already on the way to become a profitable entity. It has also been able to garner interest of venture capital companies and India Angel Network has already invested in the company. The company is planning to expand to Gurgaon, Surat, Mumbai and Goa in years to come.

Hanjer - Hanjer Biotech Energies is a waste management company that is using refuse derived fuel (RDF) from municipal solid waste to generate green power. The plant is located at Jalgaon, Maharashtra. Green Refuse Derived Fuel (RDF) is generated from dry municipal solid waste. The Solid waste is dried, crushed, screened and packed into brick form. According to Irfan Furniturewala around 18 to 20% of the Solid Waste on basis of segregation can be used for Power generation and in view of huge amount of solid waste being generated by Indian cities the potential for Green RDF is huge in India. Refuse Derived fuel is used as a substitute for conventional fossil fuels such as coal which is in short supply

Cerebra - Cerebra Integrated Technologies is doing its bit to reduce the glut of e-waste that some activists say is potentially the most dangerous waste problem in the world. Cerebra has set up one of the largest e-waste facilities in India, with the aim of becoming a leading player in this business. The vast potential of this industry extends well beyond its ability to generate huge revenues and profits for the company, and its shareholders, as it also provides a way to protect the environment and lessen harmful impact on nature. It may be surprising to know that a mobile phone consists of a combination of rare earth and precious metals - it contains 250 mg of silver, 24 mg of gold and nine mg of palladium; a laptop has 1,000 mg of silver, 220 mg of gold and 500 grams of copper. Hence, there is big business opportunity in mountains of e-waste.

Conclusion - The above business organizations are role models for other corporate organizations. They have exhibited that co-existence of 'people - planet – profit' is possible.

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Glimpses of the International Multidisciplinary Conference

Dr. Priyadarshini Karve, Chief Guest of the International Multidisciplinary Conference being greeted and welcomed by S.I.W.S. College Principal Dr. Usha Iyer

Shri. S. Sridhar, Member of S.I.W.S. Management Committee giving a Momento to the Guest of Honour Dr. Ram Boojh, Program Chief, Natural Sciences, UNESCO

Principal Dr. Usha Iyer giving Momento to Shri P. R. Kumar Member of the S.I.W.S. Managing Committee flanked by Dr. V. Rangaraj, Chairman, S.I.W.S.

Glimpses of the International Multidisciplinary Conference

Dr. Nandini Deshmukh, District Manager, Mumbai, The Climate Reality Project, India, delivering her speech on, 'Sustainable Living'.

Retired Col. Shashikant Dalvi, District Manager, Pune, The Climate Reality Project, India, delivering his speech on, 'Climate Change and Environment'.

Principal Dr. Usha S. Iyer along with panelists at the conference (from left) Shri.Stalin Dayanand, Director of Projects, Vanashakti (NGO), Shri. Nitin Raikar, Associate Director, Communications, India Wind Turbine Manufacturers' Association and Dr. Ajit S. Gokhale, Founder and Leader of Natural Solutions

Glimpses of the International Multidisciplinary Conference

Convenor of the Conference Shri. Ayyappan Iyer, Vice Principal, Self-financing Courses, S.I.W.S. College welcoming Shri. Stalin Dayanand, Director of Projects, Vanashakti (NGO)

Co-convenor of the Conference Mrs. Neeta Khanolkar, Vice Principal, Science, S.I.W.S. College welcoming Dr. Ajit S. Gokhale, Founder and Leader of Natural Solutions

Shri. Nitin Raikar, Associate Director, Communications, India Wind Turbine Manufacturers' Association expressing his views on wind energy as a sustainable source of Energy

Glimpses of the International Multidisciplinary Conference

Chief Guest Shri. Chakrapani Vasudevan, Head, Investors' Protection Fund, Bombay Stock Exchange, delivering his speech at the Valedictory function of the International Multidisciplinary Conference

Co-convenor of Conference C.A. Vaibhav Banjan, Vice Principal, (Commerce), S.I.W.S. College, congratulated by Chief Guest Shri. Chakrapani Vasudevan

Dr. M. V. Vaithilingam, Research Officer, Dept. of Extra Mural Studies & Distance Education, International Institute for Population Sciences, Mumbai, receiving his certificate for presenting a Research paper