



INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, ECONOMICS AND MANAGEMENT

CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	IMPACT OF CUSTOMER DEMOGRAPHICS ON THE CRM AWARENESS AND EFFICIENCY: AN EXPLORATORY STUDY OF THE FIVE SELECT PUBLIC SECTOR BANKS IN INDIA <i>VUTLA PADMAJA RANI, DR. MOHAMMED ABBAS ALI & DR. VIJAYA KUMAR GUDEP</i>	1
2.	A FRAMEWORK FOR LEADERSHIP DEVELOPMENT IN PUBLIC SECTOR BANKS <i>K. V. S. RAJU, DR. S. SUMAN BABU & DR. D. MASTHAN</i>	5
3.	THE EFFECTIVENESS OF LIQUIDITY MANAGEMENT ON THE NIGERIAN ECONOMY <i>LOWE, OLUSEGUN</i>	11
4.	MICROFINANCE IN CAPE COAST METROPOLIS: A BASELINE SURVEY <i>JAMES ATTA PEPRAH</i>	15
5.	CORPORATE SOLVENCY MANAGEMENT: HOW EFFECTIVE ARE CONTEMPORARY TOOLS? <i>DR. ENYI PATRICK ENYI</i>	20
6.	DEPOSITORY SYSTEM IN INDIA - A COMPARATIVE STUDY OF NSDL AND CDSL <i>DR. SULTAN SINGH</i>	26
7.	THE IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON CUSTOMER SATISFACTION IN HDFC BANK OF INDIA <i>VAHID RANGRIZ & DR. M. G. BASAVARAJA</i>	34
8.	TESTING THE CAPITAL ASSET PRICING MODEL (CAPM) – A STUDY OF INDIAN STOCK MARKET <i>DR. G. SUDARSANA REDDY</i>	40
9.	PANCHAYATS AND EMPOWERING THE RURAL POOR SPECIALLY THE WOMEN: THE WEST BENGAL EXPERIENCE <i>NIRANJAN MANDAL & ASIT KUMAR BANERJEE</i>	47
10.	MICRO-CREDIT: A STUDY OF MICRO-CREDIT USAGE BY SELF HELP GROUP MEMBERS IN GOA <i>DR. ELIZABETH JOEY HENRIQUES & DR. REKHA RAMESH GAONKAR</i>	56
11.	ROLE OF FDI IN INFRASTRUCTURE DEVELOPMENT IN INDIA <i>DR. JIMMY M. KAPADI & DR. (MRS.) HEMLATA AGARWAL</i>	61
12.	AN EMPIRICAL ANALYSIS ON BAD LOANS IN PERSONAL LOAN - WITH SPECIAL REFERENCE TO RURAL BANKS IN ODISHA <i>DR. B. CHANDRA MOHAN PATNAIK, DR. IPSEETA SATPATHY & AROOP KUMAR MOHAPATRA</i>	69
13.	MERGERS & ACQUISITIONS: AN EMPIRICAL STUDY ON THE SHORT-TERM POST- MERGER PERFORMANCE OF CORPORATE FIRMS IN INDIA <i>DR. RAMACHANDRAN AZHAGIAH & T. SATHISH KUMAR</i>	80
14.	AN EMPIRICAL ANALYSIS OF SEMI-MONTH AND TURN OF THE MONTH EFFECTS IN INDIAN STOCK MARKET <i>P. NAGESWARI, DR. M. SELVAM & DR. J. GAYATHRI</i>	104
15.	PHYSICAL INFRASTRUCTURE FACILITIES FOR AGRICULTURAL MARKETING IN HARYANA: A CASE STUDY OF SIRSA DISTRICT <i>DR. ANITA DAGAR, SANDEEP KUMAR & MUKESH KUMAR</i>	110
16.	AN EMPIRICAL STUDY OF ENTREPRENEURSHIP DEVELOPMENT IN SUB URBAN REGIONS: A CASE STUDY <i>DR. S. K. SINHA & DR. JYOTI AGARWAL</i>	113
17.	INTRODUCTION OF ISLAMIC BANKING IN INDIA: A SUGGESTED LEGAL FRAMEWORK <i>A. PANDU & DR. MOHAMMED GALIB HUSSAIN</i>	117
18.	MEASURING CORPORATE SUCCESS: STATISTICAL ANALYSIS OF FINANCIAL PERFORMANCE INDICATORS <i>DR. HEMAL PANDYA & CHETANA PARMAR</i>	121
19.	FACTORS INFLUENCING INVESTOR BEHAVIOUR: AN EMPIRICAL STUDY IN PUNJAB <i>GAURAV DAWAR & CHHAVI WADHWA</i>	125
20.	TEXTING MANIA - A SOCIAL DILEMMA <i>DR. SATEESHCHANDRA JOSHI & VINOD K. LALBEG</i>	132
21.	CLIMATE CHANGE: A MAJOR ISSUE IN THE SUSTAINABLE DEVELOPMENT OF INDIA <i>DR. PRERNA JAIN & DR. PRAGATI JAIN</i>	136
22.	ADHERENCE OF CUSTOMER NEEDS THROUGH THE REDRESSAL MECHANISM OF BANKS <i>DR. V. DARLING SELVI</i>	140
23.	MEASURING ROI: A STUDY OF HURCONOMICS ON EMPLOYEES OF THE STEEL MANUFACTURING INDUSTRY IN KARNATAKA <i>S. AMOLAK SINGH</i>	146
24.	INDIA'S RECENT ECONOMIC PERFORMANCE AND FUTURE OUTLOOK – NEED FOR CAUTIOUS OPTIMISM <i>C. BARATHI & S. PRAVEEN KUMAR</i>	150
25.	MANAGEMENT OF STONE CRUSHING INDUSTRY AND ITS IMPACT ON EMPLOYEES AND ENVIRONMENT -A CASE STUDY <i>DR. T. V. RAMANA & B. SRINIVASA RAO</i>	154
	REQUEST FOR FEEDBACK	158

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CLIMATE CHANGE: A MAJOR ISSUE IN THE SUSTAINABLE DEVELOPMENT OF INDIA**DR. PRERNA JAIN****ASST. PROFESSOR****JAIPURIA INSTITUTE OF MANAGEMENT****JAIPUR – 302 033****DR. PRAGATI JAIN****ASST. PROFESSOR****CENTRAL UNIVERSITY****KISHANGARH – 305 802****ABSTRACT**

The grave challenge that the world today faces is that of climate change. This change has been the harbinger of negative development and its more pronounced impacts are to be witnessed by the developing countries whose economies thrive on climate-sensitive sectors like agriculture – India being one of them. Climate change and sustainable development are interlinked. Sustainable development encompasses in itself “intergenerational responsibility.” The present paper is an attempt to bring forth the vulnerabilities that India is prone to due to the climate change. Further it points that it is necessary to focus on poverty, land degradation, access to water and food and human health to effectively address to climate change concerns. Given the central role of energy in reducing poverty, the paper suggests that innovative technologies in energy sector are required to meet the challenges. Lastly, the paper concludes with various initiatives to be dealt with at an individual and at the national level to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system.

KEYWORDS

Challenge, climate, mitigation.

INTRODUCTION

Climate change has become the scorching issue the world over. As the proverb goes “there is no such thing as free lunch,” the paramount cost that countries will have to incur is on mitigating climate change because of incessant exploitation of natural resources and the path of blind development that the countries have adopted. Climate change refers to the variation in the Earth’s global climate or in regional climates over time. It describes changes in the state of the atmosphere over time scales ranging from decades to millions of years. Climate change has been defined by many in many ways. While some define it as an offshoot of Earth’s natural processes, others define it as a result of human activities. Striking a balance between these two varying perspectives, climate change is defined as “a change which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”. (United Nations Framework Convention on Climate Change) Human actions have been the major contributor of global warming in the recent decades. Thus, whatever choices we make today, will have a significant bearing on the climate of the future. This makes climate change an alarming concern at the fore of sustainable development.

Brundland Commission captures “sustainable development” as a notion of discipline....Disciplining our current consumption. This sense of “intergenerational responsibility” is a new political principle, a virtue that must now guide economic growth. The industrial world has used so much of the planet’s ecological capital that the sustainability of future life is in doubt. That can’t continue. Included in this perception is the conviction that economic development must consider both protection of natural resources and maintenance of environmental quality. The descriptive term for this perception is sustainable ecological development.

LITERATURE REVIEW

Moomaw, William, et.al., (1999) opined that the economic logic of the Kyoto Protocol is that without such an agreement, countries will not have the proper incentives to address the threats from global climate change and therefore develop sustainably. In economic terms, the emission of greenhouse gases in the world economy is a classic externality—greenhouse gas emitters do not currently pay the cost of climate change’s harmful effects. Because of these perverse incentives, disruption of the global climate will proceed at an excessive pace. If such a pace is not tempered, substantial costs will accrue in terms of commerce and the environment alike. Ironically, much of the economic debate surrounding the protocol has focused on implementation costs alone rather than balancing those implementation costs with the benefits of avoiding the harmful effects of climate change and developing sustainability.

Parikh, Jyoti K., and Parikh Kirit (2002) commenting on India’s perceptions on the problem of climate change and sustainable development; they said that not all possible consequences of climate change are yet fully understood, but the three main ‘categories’ of impacts are those on agriculture, sea level rise leading to submergence of coastal areas, as well as increased frequency of extreme events. Their study focused on the need for an approach to mitigate the threat of climate change that is equitable and one that can accommodate differing perspectives on risk need to be elaborated.

Sathaye, Shukla and Ravindranath (2006), advocate the ways to pursue sustainable development strategies that contribute to mitigation of climate change through adoption of cost-effective energy-efficient technologies, forest conservation, adoption of participatory approach to forest management, rural energy, irrigation water management and rural development and efficient, fast and reliable public transport systems such as metro-railways can reduce urban congestion, local pollution and greenhouse gas emissions.

Sangal, P. P., (2008) summarized that eight national missions (solar mission, energy efficiency, sustainable habitat, water, Himalayan ecosystem, green India, Eco-green agriculture and knowledge) have been specifically outlined to simultaneously advance India’s development and climate change related objectives of adaptation and GHG mitigation. However, quantitative goals towards emission reduction have not been set. Experts suggest working out quantitative goals and specific institutional mechanisms and regulations in respect of all eight missions, besides evolving certain feasible and verifiable indicators for each mission for their impact assessment.

THE PROBLEM

The solar energy, passing through the atmosphere, is absorbed by the Earth’s surface and a significant part of it is reflected back into the atmosphere. However, the atmosphere of the Earth contains small quantities of carbon dioxide, methane and nitrous oxide (collectively called greenhouse gases (GHGs)) which act as a partial blanket that trap some of the outgoing infra red radiation and reflect it back to Earth thus keeping the surface warmer than it would otherwise be. In the absence of this greenhouse effect (trapping by GHGs) the Earth’s mean temperature would be 30°C lower than it is, (Gautam Dutt and Fabiina Gaioli, 2007) which would mean that the Earth would be an ice covered place. Thus, most of the present life forms on the Earth depend on the natural greenhouse effect for their existence. However, increase in the emission of these GHGs due to human activities causes the enhanced greenhouse effect. Global GHG emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004 (IPCC Report, 2007). Apart from the three natural GHGs

(carbon dioxide, methane and nitrous oxide), the increased emission also includes several “man-made” gases including chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). Increase in the concentration of these GHGs tends to increase the surface temperatures. This rise in the average temperature of the Earth is called global warming, which is likely to lead to unprecedented climate changes on a global scale threatening the ecosystems of the entire world.

The Intergovernmental Panel on Climate Change (IPCC) projects that the global mean temperature may increase between 1.4 and 5.8 degrees Celsius (C) by 2100. This unprecedented increase is expected to have severe impacts on the global hydrological system, ecosystems, sea level, crop production and related processes. The impact would be particularly severe in the tropical areas, which mainly consist of developing countries, including India.

Beyond this prediction, there is an overwhelming fact that we are playing havoc with our environment, upsetting the ecological interdependence. In fact, the present generation is compelling future generations to inherit an unsustainable ecological debt, which will jeopardize the future development and prosperity.

The severity of the problem can be analyzed by the following facts:

- GHG's stay in the atmosphere for long time. The consequences of our present emissions will be borne by the people living in the next century. Anthropogenic and sea-level rise would continue for centuries due to the time scales associated with climate processes, even if GHG concentrations were to be stabilized.
- The delay in coming to the consensus to cut emissions further aggravate the problem as GHG's stock accumulate, locking the future into high temperatures.
- No country can remain isolated from the impact of climate change. One country's emission is another country's problem. Hence, collective action is not an option but a compulsion.
- The developed countries instead of meeting their own obligations are endeavouring to pass the buck to the developing countries. Unless, this issue is mutually addressed, global response towards finding a sustainable solution to the problems of climate change will be seriously impeded.

IMPACT OF CLIMATE CHANGE AT GLOBAL LEVEL

The globe has witnessed the effects of climate change in the recent past. The warming of earth is bringing about massive changes. The heating up of earth is putting much more than usual moisture in the air. Hence, rains are heavier than normal and it falls all in a few days. The heat evaporates the moisture in the soil rapidly leading to widespread drought conditions. Heat and cold waves are much higher than normal. The changes in ocean temperatures are modifying the ocean currents, thus creating erratic and extreme weather conditions – creating more intense and frequent hurricanes, storms and tornadoes.

The various challenges posed by the climate change are:

- a. The crop yield as well as types of crops that can be grown across regions will have an impact. Moderate warming (increase of 1-3° C in mean temperature) is expected to benefit crop yields in temperate regions, while in lower latitudes especially seasonally dry tropics, even moderate temperature increase (1-2° C) is likely to have negative effect on production in all regions (IPCC Fourth Assessment Report, 2007). In South Asia losses of many regional staples, such as rice, millet and maize could top 10 percent by 2030. In a recent study, the International Commission for Snow and Ice (ICSE) reported that Himalayan glaciers – that are the principal dry-season water sources of Asia's biggest rivers - Ganges, Indus, Brahmaputra, Yangtze, Mekong, Salween and Yellow – are shrinking quicker than anywhere else and that if current trends continue they could disappear altogether by 2035 (Khoday, Kishan, 2007). The above predictions certainly pose a serious threat to agriculture which impacts human lives in many ways. Agriculture provides the food and also the primary source of livelihood for 38.7 percent of the world's total workforce. Thus, the livelihoods of large numbers will be put at risk.
- b. At present a whopping 1.1 billion people around the world lack access to water and 2.6 billion people are without sanitation. Climate change is expected to exacerbate current stresses on water resources. By 2020, between 75 and 250 million people are projected to be exposed to increased water stress due to climate change. Climate (IPCC, 2007). Spreading water scarcity is contributing to food insecurity and heightened competitions for water both within and between countries. As the world population expands and the consumption of water spirals upwards, water problems are bound to intensify. By 2025, 40 per cent of the world's population, more than 3 billion in all, may be living in countries experiencing water stress or chronic water scarcity.
- c. Nearly 70 % of Earth's surface comprises of water in the form of seas and oceans. Sea level rise under warming is inevitable. Sea level rise is both due to thermal expansion as well as melting of ice sheets. Thermal expansion would continue for many centuries even after GHG concentrations have stabilized causing an eventual sea level rise much larger than projected for the 21st century. If warming in excess of 1.9 to 4.6°C above pre-industrial level be sustained over many centuries then the final rise in sea level due to melting polar ice could be several meters, because it will be in addition to that of rise of sea level due to thermal expansion (IPCC, 2007).
- d. Devastating effects on the native habitats of many animals and plants due to global warming is likely to drive a considerable number of today's known animal and plant species to extinction. According to International World Wildlife Fund (WWF) and National Wildlife Federation in the United States species from the tropics to the poles are at risk. Many species may be unable to move to new areas quickly enough to survive changes that rising temperatures will bring to their historic habitats. One-fifth of the world's natural areas may be facing a “catastrophic” loss of species. Another survey in 2004 of 5,743 amphibian species indicated that one in every three species was in danger of extinction due to global warming (Bruce E. Johansen). Studies predict that global warming will also lead to extinction of insects in the tropical zone by the end of the century while insects in the temperate zones and the poles could experience a dramatic increase in numbers. It will also have catastrophic impact on the marine ecosystems. They will be affected not only by an increase in sea temperature and changes in ocean circulation, but also by ocean acidification, as the concentration of dissolved carbon dioxide (carbonic acid) rises. This is expected to negatively affect shell forming organisms, corals and their dependent ecosystems. Accelerated warming of the atmosphere will also alter the flora and fauna around the world.
- e. Each year, about 800,000 people die from causes attributable to air pollution, 1.8 million from diarrhoea resulting from lack of access to clean water supply, sanitation, and poor hygiene, 3.5 million from malnutrition and approximately 60,000 in natural disasters. Climate change has a direct impact on human health. For example, the warmer the climate the likelihood of its impact on human health becomes worse. Available studies suggest that there will be an increase in health problems. It is anticipated that there will be an increase in the number of deaths due to greater frequency and severity of heat waves and other extreme weather events. The World Health Organization (WHO) in their studies have indicated that due to rising temperatures, malaria cases are now being reported for the first time from countries like Nepal and Bhutan. It has also been predicted that an additional 220-400 million people could be exposed to malaria- a disease that claims around 1 million lives annually. Dengue fever is already in evidence at higher levels of elevation in Latin America and parts of East.

INDIA'S CONCERN ABOUT CLIMATE CHANGE

The overriding immediate concern for India is the fast pace at which negotiations are taking place on the climate front. India's main energy resource is coal. With the threat of climate change, India is called upon to change its energy strategy based on coal, its most abundant resource, and to use other energy sources (e.g. oil, gas, renewables and nuclear energy) instead, which may turn out to be expensive. Thus, an immediate issue is to come up with a better negotiation strategy such that India have more freedom to decide which type of energy to use, how to generate power, how to reduce methane emissions by agricultural practices or forestry and so on.

Low Agriculture Productivity: Agriculture will be adversely affected not only by an increase or decrease in the overall amounts of rainfall but also by shifts in the timing of the rainfall. Any change in rainfall patterns poses a serious threat to agriculture, and therefore to the economy and food security. Summer rainfall accounts for almost 70 per cent of the total annual rainfall over India and is crucial to Indian agriculture. However, studies predict decline in summer rainfall by the 2050s. Semi arid regions of western India are expected to receive higher than normal rainfall as temperatures soar, while central India will experience a decrease of between 10 and 20 per cent in winter rainfall by the 2050s. Relatively small climate changes can cause large water resources problems particularly in

arid and semi arid regions. Semi arid regions of western India are expected to receive higher than normal rainfall as temperatures soar, while central India will experience a decrease of between 10 and 20 per cent in winter rainfall by the 2050s. Productivity of most crops may decrease due to increase in temperature and decrease in water availability, especially in Indo-Gangetic plains. This apart, there would be a decline in the productivity of rabi as compared to kharif season crops. Rising temperature would increase fertilizer requirement for the same production targets and result in higher GHG emissions, ammonia volatilization and cost of crop production (M.S. Swaminathan, 2008). Increased frequencies of droughts, floods, storms and cyclones are likely to increase agricultural production variability. Therefore, India has to place equal emphasis on saving lives and sustaining livelihoods.

Sea Level Rise: Large-scale emigration from coastal zones is expected due to submergence of coast-lines after sea levels have risen. This will create large numbers of environmental refugees especially from low-lying delta regions in poor countries. Furthermore, intrusion of sea-water in the ground water and changes in temperature can reduce agricultural and fishing incomes. Countries dependent on coastal fishery and agriculture, which most often include developing countries, are likely to be adversely affected. If a one-meter sea level rise were to take place today, it would displace 7 million persons in India (ADB, 1995). In the future many more may be displaced. 35% of the land in Bangladesh would be submerged by a one-meter rise. The coastal states of Maharashtra, Goa and Gujarat face a grave risk from the sea level rise, which could flood land (including agricultural land) and cause damage to coastal infrastructure and other property. Goa will be the worst hit, losing a large percentage of its total land area, including many of its famous beaches and tourist infrastructure. Mumbai's northern suburbs like Versova beach and other populated areas along tidal mud flats and creeks are also vulnerable to land loss and increased flooding due to sea level rise. Flooding will displace a large number of people from the coasts putting a greater pressure on the civic amenities and rapid urbanisation. Sea water percolation due to inundations can diminish freshwater supplies making water scarcer. The states along the coasts like Orissa will experience worse cyclones. Many species living along the coastline are also threatened.

Water Scarcity: Water resources will come under increasing pressure in the Indian subcontinent due to the changing climate. The Himalayan glaciers are sources of fresh water for perennial rivers, in particular the Indus, Ganga, and Brahmaputra river systems. In recent decades, the Himalayan region seems to have undergone substantial changes as a result of extensive land use (e.g. deforestation, agricultural practices and urbanization), leading to frequent hydrological disasters, enhanced sedimentation and pollution of lakes. There is evidence that some Himalayan glaciers have retreated significantly since the 19th century (Pradipto Ghosh, 2008). Available records suggest that the Gangotri glacier is retreating about 28 m per year. Any further warming is likely to increase the melting of glaciers more rapidly than the accumulation. Glacial melt is expected to increase under changed climate conditions, which would lead to increased summer flows in some river systems for a few decades, followed by a reduction in flow as the glaciers disappear. As a result of increase in temperature significant changes in rainfall pattern have been observed during the 20th century in India. A serious environmental problem has also been witnessed in the Indo-Gangetic Plain Region (IGPR) in the past whereby different rivers (including Kosi, Ganga, Ghaghara, Son, Indus and its tributaries and Yamuna) changed their course a number of times. The recent devastating floods in Nepal and Bihar due to change of course of River Kosi is a case in point.

ADDRESSING CLIMATE CHANGE

Sathaye, Shukla and Ravindranath (2006), advocate the ways to pursue sustainable development strategies that contribute to mitigation of climate change: Adoption of cost-effective energy-efficient technologies in electricity generation, transmission distribution, and end-use can reduce costs and local pollution in addition to reduction of greenhouse gas emissions. Shift to renewables, some of which are already cost effective, can enhance sustainable energy supply; can reduce local pollution and greenhouse gas emissions. Adoption of forest conservation, reforestation, afforestation and sustainable forest management practices can contribute to conservation of biodiversity, watershed protection, rural employment generation, increased incomes to forest dwellers and carbon sink enhancement. Efficient, fast and reliable public transport systems such as metro-railways can reduce urban congestion, local pollution and greenhouse gas emissions. Adoption of participatory approach to forest management, rural energy, irrigation water management and rural development in general can promote sustained development activities and ensure long-term greenhouse gas emission reduction or carbon sink enhancement. Rational energy pricing based on long-run-marginal cost principle can level the playing field for renewables, increase the spread of energy-efficient and renewable energy technologies, and the economic viability of utility companies, ultimately leading to greenhouse gas emission reduction.

GLOBAL OULOOK - THE CANCUN SUMMIT

The Cancún Climate Change Summit, COP 16, took place in Cancún, Mexico from 29 November to 10 December 2010. The negotiators faced many challenges picking up from the widely-criticized Copenhagen summit.

Copenhagen, COP 15 (7 December to 18 December 2009), was under considerable pressure from the international community to deliver a legally binding document to cut greenhouse gas emissions. The end result, however, was the non-binding Copenhagen Accord, a two-page agreement which states that future temperature rises should be limited to 2°C, but included no emission targets. This deal was far from any global agreement on replacing the Kyoto Protocol (due to expire in 2012) and was largely seen as a failure of global cooperation.

Before the Cancún talks even began, any high expectations fell after several key people, including UN Secretary Ban Ki-Moon and UNFCCC Executive Secretary Christiana Figueres, expressed little hope for reaching any new binding deal at Cancún, and urged to reach a modest agreement instead.

The major challenge facing Cancún was to transform the Copenhagen Accord into a working plan of action. Many hoped that Cancún would be seen as a turning point in climate change negotiations.

The official talks ended on December 10 and marked a turning point in the global negotiations to agree a global deal to tackle dangerous climate change.

Key outcomes from the agreements at the Summit are:

- **Objective:** agreed to peak emissions and an overall 2 degree target to limit temperature rise.
- **Emissions:** bringing details of what developed and developing countries are doing to tackle climate change, promised in Copenhagen, into the UN system so they can be assessed.
- **MRV:** agreed a system so we know how countries are living up to their promises to take action on emissions
- **Long-term finance:** established the Green Climate Fund and will start to get it ready to help developing countries go low carbon and adapt to climate impacts.
- **Deforestation:** agreed to slow, halt and reverse destruction of trees and agree the rules for delivering it and for monitoring progress.
- **Technology/Adaptation:** set up the mechanisms to help developing countries access low carbon technology, and adapt to climate change

TIPS TO SAVE OUR CLIMATE: THE GANDHIAN VIEW

Gandhian philosophy is the need of the day. Mahatma Gandhi, an ardent champion of sustainable development, sternly opposed the colonial modernity which went beyond the carrying capacity of the planet earth and exploited people and resources across the planet. He said long ago in 1924, "Earth provides enough to satisfy every man's need, but not any man's greed". Today, the mankind should remodel their life styles if they are concerned about the mother earth and the future generations and lead the life of plain living and high thinking as advocated by Gandhiji. Following are certain tips which should be adopted to help save our climate:

- Walk or use bike instead of driving a car whenever one can manage. Cars and trucks run on fossil fuels which release carbon dioxide into the atmosphere. For every mile traveled, one pound of carbon can be saved.
- Teleconference and videoconference should be promoted for professional meetings. This saves time, money and carbon emissions.
- Use compact fluorescent light bulbs instead of incandescent bulb, which will save 100 pounds of carbon over the life of the bulb.

- Use recycled products, as products made from recycled paper, glass, metal and plastic reduce carbon emissions because they use less energy to manufacture than products made from completely new materials.
- Check your automobile monthly to ensure tires are inflated.
- Do not cut trees and plant new ones.

CONCLUSION

Climate change is the crucial issue of our times. It is perhaps, the greatest challenge to sustainable development. It should be addressed by all countries with a shared perspective, free from narrow and myopic considerations. The developed countries need to look beyond their narrow self interests and work jointly with the developing countries to evolve cooperative and collaborative strategies on the issue of climate change, which is of immense relevance for the future of mankind.

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