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INNOVATIVE GREEN ICT FOR ENVIRONMENTAL SUSTAINABILITY

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Abstract: -Environmental pollution is one of the serious problems faced by the people most of the countries of the world. Especially in the urban areas, those are characterized by rapid growth of population due to high fertility, low mortality and increasing rural-urban migration and industrialization. It is preferable to prevent environmental damage from occurring in the first place, rather than attempting to restore degraded environmental resources and it is not possible without environmental awareness. This paper is based on an empirical survey, was undertaken to compare the environmental awareness of male, female and science, commerce and arts teachers of higher education in Bhopal, M.P., India and also to study the role of Information and Communication Technology (ICT) in increasing level of environmental awareness.
ICT is an environmentally friendly technology, which conserves natural resources and the environment. It can improve environmental performance and address climate change across the economy. ICT innovation is a key element to spur green growth in the economic crisis and recovery. The green ICT has diverse benefits that can create substantial value. It is the present & as well as future of the society. Its main goal is to find ways to produce technology in ways that do not damage or deplete the Earth's natural resources and help to increase the awareness for environment.

Keywords: Environmental awareness, Environmental pollution, Green ICT, Information and Communications Technology, ICT innovation.

1. Introduction

The role of ICT in the protection of the environment and combating climate change has received significant attention in different types of international forums. Increasing temperatures and sea level and frequent incidences of floods and storms constitute the evident impact of climate change, having also an effect on the balance of the ecosystems, water and food supply, public health, industry, agriculture and infrastructure (Zacharoula S. Andreopoulou, 2012). India is known for its amazing environmental diversity and to maintain this we have to conserve our environment. Environmental issues in India include various natural hazards, but major environmental issues are Forest and Agricultural land degradation, Resource depletion, Environmental degradation, Public Health, Loss of Biodiversity, Loss of resilience in ecosystems, Livelihood Security for the

Poor. We have gone about planting trees to achieve our goal towards a greener environment, but only a few of us have realized that 'technology' can play a vital role towards achievement of our goal. Though hard to believe, it has been established in a recent report by an NGO- The Climate Group that, "If we altered the way we did business with the help of technology, we could be reducing global emissions by as much as 15 percent by 2020. Not only this, we will also be indirectly contributing to savings from energy efficiency by over USD 800 billion." Wonder how a smarter use of technology could lead to such unbelievable figures? ICT can improve environmental performance, awareness and address climate change across the economy. Clean technologies and smart ICT applications are keys to effectively fight climate change, protect biodiversity and manage our water resources. On the other side, ICTs can be seen as a tool in addressing the environmental problems. Nowadays, it is possible to deploy ICTs in order to tackle the environmental footprint of a business (Buchalcevova Alena, Gala Libor, 2012).

2. Environmental Pollution & Its Affects

The natural environment, encompasses all living and non-living things occurring naturally on Earth or some region thereof. It is an environment that encompasses the interaction of all living species (Johnson, D.L. at el., 1997). Earth science generally recognizes four spheres, the lithosphere, the hydrosphere, the atmosphere, and the biosphere[2] as correspondent to rocks, water, air, and life. But, it also includes, the cryosphere and pedosphere as an active and intermixed sphere. Pollution is the introduction of contaminants into an environment that causes instability, disorder, harm or discomfort to the ecosystem i.e. physical systems or living organisms (Rice, MF 2003). Pollution can take the form of chemical substances or energy, such as noise, heat, or light. A pollutant is a waste material that pollutes air, water or soil. Some forms of pollution are air pollution, light pollution, littering, noise pollution, soil pollution, thermal pollution, visual pollution, water pollution and etc. Pollution affects not only human beings but the whole environment. Adverse air quality can kill many organisms including humans. Water pollution causes approximately 14,000 deaths per day, mostly due to contamination of drinking water by untreated sewage in developing countries. An estimated 700 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrhea sickness every day. In India, air pollution is believed to cause 527,700 fatalities a year. In India's out of 3,119 towns and cities, just 209 have partial treatment facilities and only 8 have full wastewater treatment facilities (WHO 1992). 114 cities dump untreated sewage and partially cremated bodies directly into the Ganges River. Populations in developing countries are especially at risk because of often inadequate knowledge, lack of appropriate regulation and enforcement as well as barriers to accessing "cleaner" technologies. These complex and urgent problems require innovative, flexible, and action-oriented approaches to finding solutions (McCormick, John 2001).

2.1 Environmental Policy

"What of thee I dig out, let that quickly grow over, Let me not hit thy vitals, or thy heart."-AtharvaVeda.
Environmental policy is any action deliberately taken to manage human activities with a view to prevent, reduce, or mitigate harmful effects on nature and natural resources, and ensuring that man-made changes to the environment do not have harmful effects on humans.(McCormick, John, 2001) Thus, environmental policy focuses on problems arising from human impact on the environment, which retroacts onto human society by having an impact on human values such as good health or the 'clean and green' environment. Environmental issues generally addressed by environmental policy include air and water pollution, waste management, ecosystem management, biodiversity protection, and the protection of natural resources, wildlife and endangered species. Relatively recently, environmental policy has also attended to the communication of environmental issues.
National Environment Policy, 2006 was the first initiative in strategy-formulation for environmental protection in a comprehensive manner. It undertakes a diagnosis of the causative factors of land degradation with a view to flagging the remedial measures required in this direction. It recognizes that the relevant fiscal, tariffs and sectoral policies need to take explicit account of their unintentional impacts on land degradation. Legislative Framework of National Environmental Policies in India includes Water (Prevention and Control of Pollution) Act, 1974, Water (Prevention and Control of Pollution) Cess Act, 1977, Air (Prevention and Control of Pollution) Act, 1981, Atomic Energy Act of 1982, Motor Vehicles Act ,1988, The Wildlife (Protection) Act,

1972 , The Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 (EPA), The National Environment Appellate Authority Act, 1997, Public Liability Insurance Act (PLIA), 1991, and National Environment Tribunal Act, 1995.

3. Green technology: An effective tool for Environment Conservation

Green technology is referred to as environmental technology and clean technology which is helpful to conserve environment. Green technology is the application of the environmental science to conserve the natural environment and resources, and to curb the negative impacts of human involvement. Currently, this clean technology is in the beginning stages of its development, so the future will only bring bigger and better things for this field. Its main goal is to find ways to produce technology in ways that do not damage or deplete the Earth's natural resources. Next, green technology is so that products can be reused and recycled. The field of "green technology" encompasses a continuously evolving group of methods and materials, from techniques for generating energy to non-toxic cleaning products. The present expectation is that this field will bring innovation and changes in daily life of similar magnitude to the "information technology" explosion over the last two decades. These technologies are technologies that enable environmentally friendly sources of power including renewable and ultra-clean energy sources. Green technologies include Information and communications technology, Green Nanotechnology, Green Chemistry, Biotechnology, Sustainable Energy, Green Building, Green Preferred purchasing and etc.

3.1 Information and Communication Technology (ICT)

ICT is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. ICT now permeates virtually all aspects of our lives. It is inextricably linked with our desire for a prosperous and competitive economy, a sustainable environment, and a more democratic, open, healthy society. It covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form such as personal computers, digital television, email, robots and etc. So ICT is concerned with the storage, retrieval, manipulation, transmission or receipt of digital data. On the other hand ICT can improve environmental performance and address climate change across the economy. The environmental benefits of ICT applications are evident in areas such as water management, biodiversity protection, and pollution reduction. ICT innovation is a key element to spur green growth and environmental awareness in the society.

3.2 Why ICT for greener world?

“The ICT industry is responsible for approximately 2% of global CO2 emission. ICT solutions have the potential to be an enabler to reduce a significant part of the remaining 98% of total CO2 emitted by non-ICT industries”-Gartner/HP/McKInsey/WWF. ICT should be a core element of any organization’s green strategy. There is significant opportunity to capture value by designing and implementing a sensible green element within the ICT realm.

Achieving the greening of ICT is a very viable and high-value first step in any green strategy. The impact of a greener ICT is multi-fold such as smaller physical footprint, lower carbon footprint, lower heating/cooling costs, compliance with government regulations, good marketing, virtual Meetings.

3.3 Scope of ICT in India

The Indian ICT Industry has witnessed excellent growth in the past two decades. Capitalizing on its advantages of talent pool, lower cost of operation and the innovative remote delivery model, India has established itself as a global leader in the ICT sector. Today, India is clearly acknowledged as the global services hub. “India's ICT market is estimated to grow at a five-year Compound Annual Growth Rate (CAGR) of 20.3% to reach $24.3 billion, or nearly 2% of the country's Gross Domestic Product (GDP), by 2011.” - Gartner India CIO Summit 2008. The government started with introduction of initiatives for software development in rural areas for taking

ICT to the masses. Madhya Pradesh, the second largest State of India and ICT have a vital & challenging role to play in streamlining Governance in the state. The State is fast emerging as a major destination for the IT industry with lot of activity on e-Governance in recent years. National Informatics Centre (NIC) State Centre, Bhopal was setup in the year 1988, to play a catalytic role in promoting informatics culture and providing ICT services to Government Departments and organizations.

4. Green ICT & Environmental Awareness

Green computing or green ICT refers to environmentally sustainable computing or ICT. According to the 'Harnessing Green IT: Principles and Practices' "the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems—such as monitors, printers, storage devices, and networking and communications systems—efficiently and effectively with minimal or no impact on the environment."(San Murugesan, 2008). A holistic view, "greening" ICT is not just about reducing direct power consumption. Some Initiatives and Areas of Focus for 'Green ICT' are such as Smart buildings, Virtual collaboration, Dematerialization, Data centre and Procurement.
Environmental Education, Awareness and Training plays a significant role in encouraging and enhancing people's participation in activities aimed at conservation, protection and management of the environment, essential for achieving sustainable development. Some of the major activities undertaken in this regard are as follows: National Environment Awareness Campaign (NEAC). The NEAC was launched in mid 1986 with the objective of creating environmental awareness at the national level. It is a multi-media campaign which utilizes conventional and non-conventional methods of communication for disseminating environmental messages to a wide range of target groups. The best way to reach out to them and make them aware of the environmental problems is through media, particularly the electronic media. The Doordarshan and few other television channels are proposed to be extensively used for telecasting environment based programmes. The Ministry has sponsored organization of a film festival "Vatavaran – 2001" by Centre for Media Studies, Delhi in April 2002.

The ICT technologies & techniques which can help to increase the Environmental awareness

- Computers
- Scanners
- E-mail
- Storage systems
- Fax over IP (Internet protocol)
- Wireless local area networks.
- Secure remote access
- E-learning systems.
- Advanced printers
- ICT for Paperless office
- Through sms & e-massages
- Through online training programs
- Through virtual meetings
- Through voice massages or video clipping

4.1 Environmental Awareness in Teachers of Higher Education

According to a Report of a Conference of African Education at Nairobi (1968) "Environmental Education is to create an awareness and understanding of the evolving social and physical environment as a whole, its natural, manmade, cultural, spiritual resources together with the rational use and conservation of these resources for development.

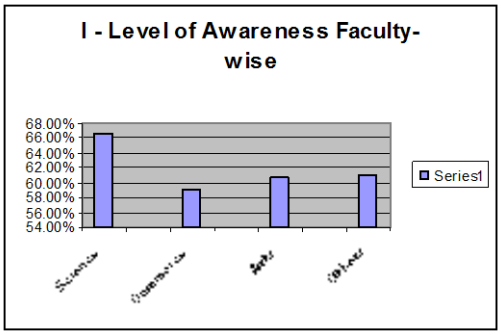

Fig.1 Level of awareness faculty wise

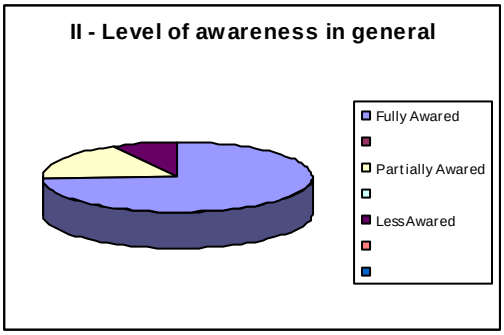

Fig.2 Level of awareness in general

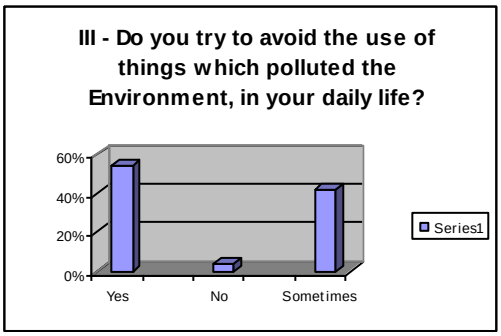

Fig.3 Environment protection practice

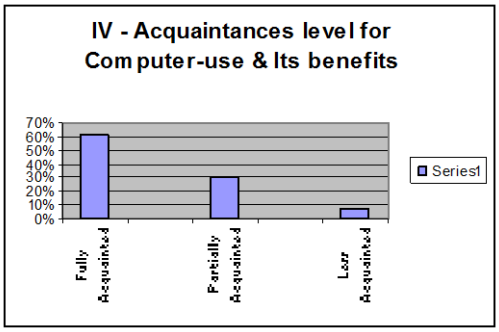

Fig.4 Level of computer practices

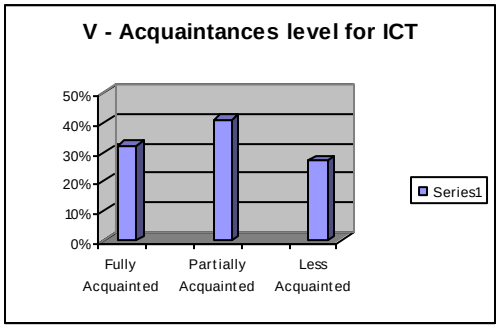

Fig.5 Level of awareness for ICT

The present study was undertaken to compare the environmental awareness of male, female and science, commerce and arts teachers of higher education in Bhopal, M.P., India and also to study the role of Information and Communication Technology (ICT) in increasing level of environmental awareness. The sample comprised 100 (23 males and 77 females) teachers of higher education for the study Environment Awareness Ability. It was found that environmental awareness of male and female teachers of higher education of Bhopal, M.P., India remains almost same. On the basis of survey the key findings which can be highlighted are as follows:

- The level of Environmental awareness in Science faculties is 66.66%, in Commerce faculties 59%, in Arts faculties 60.7% and in others 61%.
- In general 74% teachers are fully aware, 18% teachers are partially aware and rests 8% have no awareness for Environmental issues.
- However, 54% teachers try to avoid the thing which polluted the environment, 42% teachers some times try to follow and rest 4% do not avoid.
- Overall, 61% teachers are fully acquainted to the benefits of computer, 31% teachers are partially acquainted and rest 8% has no acquaintance.
- There are 32% teachers have the knowledge about ICT, 41% teachers are partially acquainted and rest 27% have no knowledge about ICT.
- But around 95% teachers are interested to learn how ICT can help to conserve the environment.

Conclusion

ICT has helped India truly become a global village by taking technology to the masses. Thus replacing physical services with their virtual offerings are likely to save as much as 6 % of the benefit listed there in terms of saving CO2 emissions. It has been estimated that the greatest savings in global emissions can be made if ICT was used more in the space of infrastructure services. The ICT 20 industry has helped us unleash all our capabilities towards leveraging technology to the maximum in order to build a greener world. ICT can slow down global warming, improve environmental performance and spearhead the economic recovery. On the other hand ICT technologies & techniques can help to increase the Environmental awareness and with the advent of computers, a perfect world without paper can exist. A move to a green technology or green ICT isn't therefore as simple as first thought, but meeting these challenges will not only achieve the business benefits organizations, but will also provide a far more secure green & clean environment. Thus we can say ICT can not only help to conserve the environment, but can also increase level of environmental awareness. All these findings urge to make efforts to provide the necessary infrastructure in the form of internet facilities, E-learning systems and online training program related to environmental issues to the teachers of higher education to increase the level of environmental awareness.

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