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The Effect of Adopting Green Technology on Small and Medium Enterprises: A Case Study of Govindpura Industrial Area of Bhopal

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Abstract
GT encompasses a continuously evolving group of methods or materials, from techniques for generating energy to non-toxic cleaning products. It is that innovation which reduces waste by changing patterns of production and consumption. It is also defined as environmental healing technology, which reduces environmental damages created by the products and technologies for peoples' conveniences. Most of the businesses may not be very excited to "go green" by reducing emissions since their motto is to make money not to save the planet. The global strategy should be to help businesses do both. Reliable data on emerging technologies for sustainability assessment are still inadequate; the recommendations are largely based on qualitative methods and on an operational definition of sustainability using priority indicators. When 1901 industrialization started and today there is a globalization in whole world market there is an issue of sustainable development in all industrial development views. From energy conservation to the utilization of renewable energy in every area there is a urgent need for sustainable industrial development for sustainable and eco friendly social all dimensional growth .In this paper this has been discussed that the importance of sustainability for eco friendly growth in industries area of Govindpura region of Madhya Pradesh which is the main industrial area of Bhopal region. I had tried to calculate the carbon foot print of that region & the energy conservation with the help of omnipresent, freely available solar PV panels.
Key Words – *Green technology (GT), Non toxic cleaning product, Sustainability, carbon emission.*

I. INTRODUCTION –

As convention fossil fuel energy sources diminish and the world's environmental concern about acid deposition and global warming increases renewable energy sources (solar, wind, tidal, biomass and geothermal etc) are attracting more attention as alternative energy sources. These are all pollution free and one can say eco friendly. These are available at free of cost. In India, there is severe power shortage and associated power quality problems, the quality of the grid supply in some places is characterized by large voltage and frequency fluctuations, scheduled and un scheduled power cuts and load restrictions. Load shedding in many cities in India due to power shortage and faults is a major problem for which there is no immediate remedy in the near future since the gap between the power demand and supply is increasing every year. This led to rapid usage of stand-by petrol or diesel generator sets and conventional battery inverter sets in both Urban and rural areas.

II Green Technology–

Technology can be termed as the application of knowledge for practical purposes. In this context, technology allows people to become more efficient or to do things that were not possible before. To benefit from technology, it needs to be successfully linked with country's overall development objectives and applied to solving socio-economic problems. The productivity increase is possible through environment-friendly and profitable technologies. Not necessary all the profitable technologies are adopted since barriers to practice new technologies and unavailability of market for environmental attributes associated with green technologies (GT) can limit their effectiveness. The adoption and diffusion of alternative practices are also influenced by the factors such as, the size of the farm, economic risk, and geographical location. This should be one of the important issues for policy consideration.

A. Solar photovoltaic technology-

It is used for instance, converts sunlight into electricity using semi conductor modules. Used generally for meeting lighting requirements, they can also be used for pumping water, refrigeration, communication, and charging batteries. Solar photovoltaic has application as green agricultural energy source for pumping water, street lighting in villages, lighting in rural houses and pest management. Is a method of generating electrical

power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect? Photovoltaic power generation employs solar panels composed of a number of solar cells containing a photovoltaic material. Materials presently used for photovoltaic include mono crystalline silicon, polycrystalline silicon, amorphous silicon, cadmium telluride, and copper indium gallium selenide/sulphide. The best silicon PV modules now available commercially have an efficiency of over 18%, and it is expected that in about 10 yrs. Time module efficiencies may rise over 25%.

B. Wind energy-

Is in a boom cycle Overall, wind energy contributes only 1% of global electricity generation, but some countries and regions are already producing up to 20%. Its importance is increasing in the sense that comparatively with other sources; the wind energy produces less air pollutants or greenhouse gases. It is the conversion of wind energy into a useful form of energy, such as using: wind turbines to make electricity, windmills for mechanical power, wind pumps for water pumping or drainage, or sails to propel ships. Wind is the movement of air across the surface of the Earth, from areas of high pressure to areas of low pressure. The surface of the Earth is heated unevenly by the Sun, depending on factors such as the angle of incidence of the sun's rays at the surface (which differs with latitude and time of day) and whether the land is open or covered with vegetation. Also, large bodies of water, such as the oceans, heat up and cool down slower than the land. The heat energy absorbed at the Earth's surface is transferred to the air directly above it and, as warmer air is less dense than cooler air, it rises above the cool air to form areas of high pressure and thus pressure differentials. The rotation of the Earth drags the atmosphere around with it causing turbulence. These effects combine to cause a constantly varying pattern of winds across the surface of the Earth.

III. Green Industry Defined –

Green Industry is industrial production and development that does not come at the expense of the health of natural systems or lead to adverse human health outcomes. Green Industry is aimed at mainstreaming environmental, climate and social considerations into the operations of enterprises. It provides a platform for addressing global, interrelated challenges through a set of immediately actionable cross-cutting approaches and strategies that take advantage of emerging industry and market forces. Green Industry is therefore an important pathway to achieving sustainable industrial development. It involves a two-pronged strategy to create an industrial system that does not require the ever-growing use of natural resources and pollution for growth and expansion. As, these two components are (1) the greening of existing industry, and the Creation of new “Green industries”.

V. Green Technology and Their Inter - Linkage –

Energy costs would become the second highest cost in 70% of the world's data centres by 2009. In tomorrow's world, Businesses that ignore environmental impact and don't reform business processes and working practices will be less credited. Environmental technology is the key to conservation ecology, a science of protecting biological diversity. Conservation ecology also termed as conservation biology refers to the Application of science to the conservation of genes, populations, species, and ecosystems.

IV. Technology for Environment -Friendly Industry-

Widespread environmental degradation, severe poverty around the globe and the burning concerns about achieving and maintaining good quality of life were the principal factors for taking interest in intergenerational equity, in relation to access to natural resources. As most good agricultural land has already been farmed and the region have exceeded the safe limit, primarily in Asia, the natural resources availability for further farming expansion is practically exhausted. Data shows agricultural land being increased by 13 per cent in the last 30 years at the expense of lowland forests and their rich biodiversity. With virtually no reserves of land with crop-production potential there is no controversy in developing agriculture to obtain higher yield and increased income of the farmer without affecting the environment. This approach in fact, is sustainable agriculture. Sustainability has been given due consideration because in Asian countries land use has been intensified and problems such as, unplanned exploitation of the natural soil and water resources have been realized. The skyrocketing costs of energy and agricultural inputs have reduced profitability, which has severely damaged the environment. This necessitates the proper assessment of the constraints and potentials of natural resources by examining policies of respective governments, and appropriateness of agro-technologies. The technology is a link that connects sustainability with enhanced productivity, where natural resource productivity is efficiently maintained by carefully planning the conservation and exploitation of resources such as soil, water, plants and animals. The tasks of transferring existing technology and development of cost-effective and

environment-friendly biotechnology should be taken simultaneously. The development of biotechnology is recommended to properly assess socioeconomic, food security and environmental impacts for helping the poor rural communities for maintaining sustainable agriculture. The ideal technology should be efficient, practical, cost effective and free from pollution. The sustainability factor should be looked at the ability of agricultural land to maintain acceptable levels of production over a long period of time, without degrading the environment. Some define sustainability as the maintenance of productivity under stress conditions. Industrial sustainability in this context, should seek to maximize food production within constraints of profitability

VI. Green Technology and Rural Environmental Concerns –

The major question today is to devise the technology that will save the environment without sacrificing growth. In the developing countries, majority live in rural areas and environmental degradation is more pervasive because of rapid deforestation, watershed degradation, loss of biological diversity, fuel wood and water shortages, water contamination, soil erosion and land degradation. The financial and technological assistance to the local community has shown the task of reforestation, green farming and recycling successful in building green homeland in many countries in the world. The proper allocation of resources in development plan and annual budgets should help channeling science and technology into rural areas to support the farmers for organic farming by reducing the use of chemical pesticides and fertilizers. In Thailand, an innovative Integrated Pest Management Technique, which is conducted by mixing molasses with water and stored in open bottles to trap adult moths before they lay eggs, has dramatically eliminated the use of chemical pesticides in vegetable crops. Degrading environment is slowing the growth in world food output. There is a less arable land available for conservation to agriculture. There is a declining trend in the productivity of agricultural inputs but the rural farmers have a compulsion to increase productivity from existing cropland. Technology, if understood as an application of knowledge for practical Purposes can be made viable to protect our planet by creating a centre of economic activity around technologies and products that benefit the environment. The need for investigating the contributions from agro ecology is seriously realized in recent years. Agro ecology is an approach to farming that promotes sustained yields through the use of ecologically sound farm management practices because it relies on low levels of inputs, indigenous knowledge and appropriate technologies to achieve sustainable agricultural production.

Selection of Technology –

In general, the seven criteria have been proposed to judge the appropriateness of technology by Robert C. Wicklein in his paper entitled, “Design Criteria for Sustainable Development in Appropriate Technology: Technology as if People Matter”.

a) System Independence-

It is the ability of the technological device to stand alone for doing the required job. Whether the technology will require relatively more capital or labour will be analyzed to check system independence of the technology. Since all three country covered in the study are developing country with high population pressure and unemployment, labour intensive technology will be system independence on the ground of cost. It is also kept in mind that required input for the technology is available or not.

b) Image of Modernity-

People should perceive themselves as modern by adopting the technology. The message is people’s realization that technological device can elevate the user’s social status as well as need a basic human need. Image of modernity requires that the social status of people who adopt it either increases or remains unchanged. Although social status is contextual and is quite difficult to measure, it is common in all three countries that people who are member of social organizations have high social status. It has also been found that the people who are engaged in formal organization are more likely to adopt new technology.

c) Individual Technology vs. Collective Technology-

It is the criteria to look into the societal/cultural standards in which the technology operates. In other words, it is the careful assessment of the technology that is based on group approach and becomes more system dependent. A society geared towards individual or single family unit will need more system independent technology. Collective technologies are more easily adopted as collective action reduces transaction cost.

d) Cost of Technology:-

Affordability of the technology is an important indicator for their wider use since cost is the major factor in encouraging or discouraging the application of appropriate technology in developing economies. Although the level of cost is high or low is a relative concept, in all three countries labour is relatively cheaper than capital, and therefore, labour-intensive technologies are less costly.

e) Risk Factor -

It is an important factor to find out how smoothly technology works in the local production system and the supportive system that explains to what degree is the technology system dependent or system independent.

f) Evolutionary Capacity of Technology-

If the chosen device is static it will relatively reflect the short-lived solutions to a much larger problem. The technology, which supports the continuation of development by enhancing capability to expand, can be expected to compete at the regional, national and international level.

g) Single-Purpose and Multi-Purpose Technology-

In contrast to single purpose technology, multipurpose technologies are the ones that furnish a variety of applications.

VII. National Policies for GT: Impact, Implication and Challenges-

In the literature of technology adoption, four paradigms are frequently cited to explain determinants of technology adoption and its adoption process. The first paradigm is due to Rogers (1962) known as "the innovation-diffusion-adoption model". According to this model, adoption is a mental process through which an individual passes from hearing about an innovation to its adoption that follows awareness, interest, evaluation, trial, and adoption stages. This paradigm emphasizes the role of information, risk factors and the social position of the decision makers in the community. The second model is due to known as economic constraint model. According to this model lack of resource endowment is the major constraint for potential adopter. Lack of access to capital and inadequate farm size significantly obstruct adoption decisions. Although this model is accepted by various scholars (e.g. Hooks, Napier et al.), its superiority has been challenged by Nowak.

VIII. Opportunity Presented By Green Industry –

A. Climate Change Mitigation and Adaptation –

Climate negotiations are still far from delivering a global agreement that can ensure the level of GHG emission reduction that is needed to stabilize the climate. The IEA states in the 'Energy Technology Perspectives 2010' that according to the United Nations Intergovernmental Panel on Climate Change (IPCC), reductions of at least 50 per cent in global CO2 emissions compared to 2000 levels will need to be achieved by 2050 to limit the long term global average temperature rise to between 2oC and 2.4oC. However, recent studies suggest that climate change is occurring even faster than previously expected and that even the "50 per cent by 2050" goal may be inadequate to prevent dangerous climate change.

IX. Carbon Foot Print:-

A measure of the total amount of carbon dioxide (CO_2) and methane (CH_4) emissions of a defined population, system or activity, considering all relevant sources, sinks and storage within the spatial and temporal boundary of the population, system or activity of interest. Calculated as carbon dioxide equivalent (CO_2e) using the relevant 100-year global warming potential (GWP100).

XII. Conclusions -

The calculation shows when used correctly technology has promoted sustainable industrial growth and reduced widening rural-urban income disparities. The application of green technology is the answer for sustainable development but poor countries have not been able to use applicable technology largely because of their inability to afford to the available alternatives. Efforts are needed to align economic development policies with the goal of increasing the realization of human capabilities. GT in the reviewed countries has mostly minimized environmental hazards and made farmers more productive through enhanced efficiency. The lesson that has been drawn from this study is since distributive structure and property system especially in India not very satisfactory, care should be given to access land and credit; the access in health, the access in clean water and education; and above all the access in employment.

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