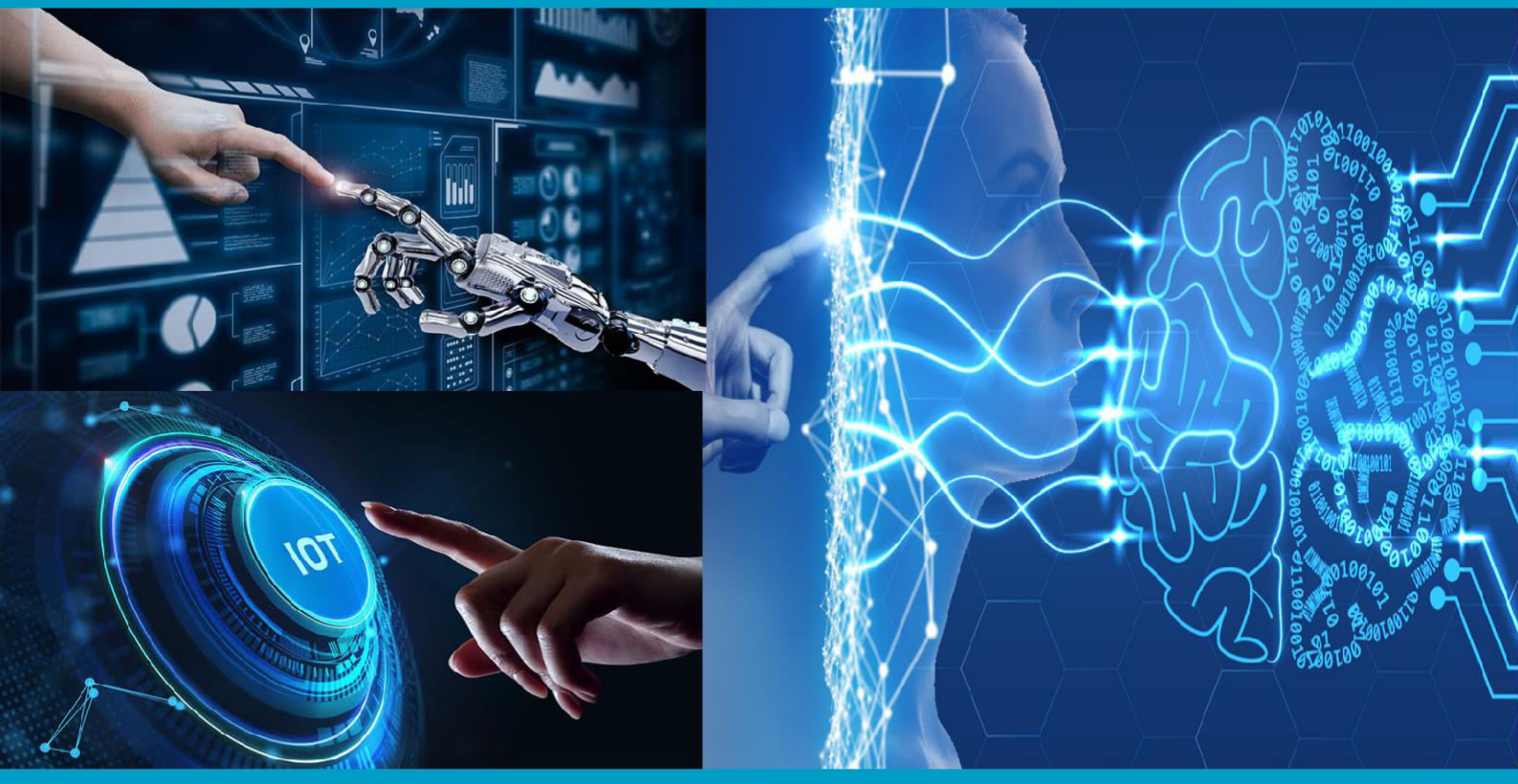
IJMRSETM

e-ISSN: 2395 - 7639



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING, TECHNOLOGY AND MANAGEMENT

Volume 10, Issue 6, June 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.580

International Journal of Multidisciplinary Research in Science, Engineering, Technology & Management (IJMRSETM)

| ISSN: 2395-7639 | www.ijmrsetm.com | Impact Factor: 7.580| A Monthly Double-Blind Peer Reviewed Journal |

| Volume 10, Issue 6, June 2023 |

Various Technological Innovations and Practices that Can Protect the Environment

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ABSTRACT: Environmental technology (envirotech) or green technology (greentech), also known as clean technology (cleantech), is the application of one or more of environmental science, green chemistry, environmental monitoring and electronic devices to monitor, model and conserve the natural environment and resources, and to curb the negative impacts of human involvement. The term is also used to describe sustainable energy generation technologies such as photovoltaics, wind turbines, etc. Sustainable development is the core of environmental technologies. The term environmental technologies is also used to describe a class of electronic devices that can promote sustainable management of resources.

KEYWORDS: technological innovations, monitoring, protect, sustainable, electronic, resources, conserve, green

I.INTRODUCTION

Ecological modernization is a school of thought that argues that both the state and the market can work together to protect the environment.[1] It has gained increasing attention among scholars and policymakers in the last several decades internationally. It is an analytical approach as well as a policy strategy and environmental discourse (Hajer, 1995). Environment friendly processes, or environmental-friendly processes (also referred to as eco-friendly, nature-friendly, and green), are sustainability and marketing terms referring to goods and services, laws, guidelines and policies that claim reduced, minimal, or no harm upon ecosystems or the environment.[1]

Companies use these ambiguous terms to promote goods and services, sometimes with additional, more specific certifications, such as ecolabels. Their overuse can be referred to as greenwashing.[2][3][4] To ensure the successful meeting of Sustainable Development Goals (SDGs) companies are advised to employ environmental friendly processes in their production.[5] Specifically, Sustainable Development Goal 12 measures 11 targets and 13 indicators "to ensure sustainable consumption and production patterns".[6]

The International Organization for Standardization has developed ISO 14020 and ISO 14024 to establish principles and procedures for environmental labels and declarations that certifiers and eco-labellers should follow. In particular, these standards relate to the avoidance of financial conflicts of interest, the use of sound scientific methods and accepted test procedures, and openness and transparency in the setting of standards.[7]

Recycling is the process of converting waste materials into new materials and objects. This concept often includes the recovery of energy from waste materials. The recyclability of a material depends on its ability to reacquire the properties it had in its original state.[1] It is an alternative to "conventional" waste disposal that can save material and help lower greenhouse gas emissions. It can also prevent the waste of potentially useful materials and reduce the consumption of fresh raw materials, reducing energy use, air pollution (from incineration) and water pollution (from landfilling).[8]

Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse, and Recycle" waste hierarchy.[2][3] It promotes environmental sustainability by removing raw material input and redirecting waste output in the economic system.[4] There are some ISO standards related to recycling, such as ISO 15270:2008 for plastics waste and ISO 14001:2015 for environmental management control of recycling practice.[9]

Technocentrism is often contrasted with ecocentrism. Ecocentrics, including deep ecologists, see themselves as being subject to nature, rather than in control of it. They lack faith in modern technology and the bureaucracy attached to it so they maintain responsibility for the environment.[7] Ecocentrics will argue that the natural world should be respected for its processes and products and that low-impact technology and self-sufficiency is more desirable than technological control of nature.[2] Fundamentally, ecocentrism maintains that concerns for the natural environment should dominate the needs of humankind, pitting it against the anthropocentric position of technocentrism, which pushes the needs of humans at the forefront even at the expense of everything else.[8]

| ISSN: 2395-7639 | www.ijmrsetm.com | Impact Factor: 7.580| A Monthly Double-Blind Peer Reviewed Journal |

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There are theorists who claim that despite their incompatibilities, technocentrism and ecocentrism can be integrated into one framework because they share several similarities. For instance, it is proposed that technocentrism can facilitate ecocentrism, particularly in the area of policy-making, through shared goals and shared recycled resources.[9] There is also the case of the so-called sustaincentric worldview, which was developed as a product of ecocentric and technocentric views.[10]

Examples

- Biofiltration
- Bioreactor
- Bioremediation
- Desalination
- Thermal depolymerization
- Composting toilet
- Pyrolysis[10]

Water purification

Water purification: The whole idea/concept of having dirt/germ/pollution free water flowing throughout the environment. Many other phenomena lead from this concept of purification of water. Water pollution is the main enemy of this concept, and various campaigns and activists have been organized around the world to help purify water.[1]

Air purification

Air purification: Basic and common green plants can be grown indoors to keep the air fresh because all plants remove CO_2 and convert it into oxygen. The best examples are: *Dypsis lutescens, Sansevieria trifasciata,* and *Epipremnum aureum*.[2] Besides using the plants themselves, some species of bacteria can also be added to the leaves of these plants to help remove toxic gases, such as toluene.[3][4]

Sewage treatment

Sewage treatment is conceptually similar to water purification. Sewage treatments are very important as they purify water per levels of pollution. The most polluted water is not used for anything, and the least polluted water is supplied to places where water is used affluently. It may lead to various other concepts of environmental protection, sustainability, etc.[5]

Environmental remediation

Environmental remediation is the removal of pollutants or contaminants for the general protection of the environment. This is accomplished by various chemical, biological, and bulk methods.[6]

Solid waste management

Solid waste management is the purification, consumption, reuse, disposal and treatment of solid waste that is undertaken by the government or the ruling bodies of a city/town.[7]

Concerns over pollution and greenhouse gases have spurred the search for sustainable alternatives to our current fuel use.[11] The global reduction of greenhouse gases requires the adoption of energy conservation as well as sustainable generation. That environmental harm reduction involves global changes such as:

- reducing air pollution and methane from biomass
- virtually eliminating fossil fuels for vehicles, heat, and electricity, left in the ground.
- widespread use of public transport, battery and fuel cell vehicles
- more wind/solar/water generated electricity
- reducing peak demands with carbon taxes and time of use pricing.[12]

Since fuel used by industry and transportation account for the majority of world demand, by investing in conservation and efficiency (using less fuel), pollution and greenhouse gases from these two sectors can be reduced around the globe. Advanced energy efficient electric motor (and electric generator) technology that are cost effective to encourage their application, such as variable speed generators and efficient energy use, can reduce the amount of carbon dioxide (CO_2)

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and sulfur dioxide (SO_2) that would otherwise be introduced to the atmosphere, if electricity were generated using fossil fuels. Greasestock is an event held yearly in Yorktown Heights, New York which is one of the largest showcases of environmental technology in the United States.[8][9][10][11][12] Some scholars have expressed concern that the implementation of new environmental technologies in highly-developed national economies may cause economic and social disruption in less-developed economies.[13]

Examples

- Hydroelectricity
- Wind power
- Wind turbine
- Ocean thermal energy conversion
- Solar power
- Photovoltaic
- Wave energy
- Electric vehicle
- Heat pump
- Hydrogen fuel cell
- Green computing
- Energy conservation
- Doubly fed electric machine
- Energy saving modules

Renewable energy is the energy that can be replenished easily. For years we have been using sources such as wood, sun, water, etc. for means for producing energy. Energy that can be produced by natural objects like the sun, wind, etc. is considered to be renewable. Technologies that have been in usage include wind power, hydropower, solar energy, geothermal energy, and biomass/bioenergy.[1]

Energy conservation

Energy conservation is the utilization of devices that require smaller amounts of energy in order to reduce the consumption of electricity. Reducing the use of electricity causes less fossil fuels to be burned to provide that electricity.[2]

eGain forecasting

Egain forecasting is a method using forecasting technology to predict the future weather's impact on a building.[14] By adjusting the heat based on the weather forecast, the system eliminates redundant use of heat, thus reducing the energy consumption and the emission of greenhouse gases.[15]

II.DISCUSSION

Courses aimed at developing graduates with some specific skills in environmental systems or environmental technology are becoming more common and fall into three broads classes:

- Environmental Engineering or Environmental Systems courses oriented towards a civil engineering approach in which structures and the landscape are constructed to blend with or protect the environment;[3]
- Environmental chemistry, sustainable chemistry or environmental chemical engineering courses oriented towards understanding the effects (good and bad) of chemicals in the environment. Such awards can focus on mining processes, pollutants and commonly also cover biochemical processes;
- Environmental technology courses oriented towards producing electronic, electrical or electrotechnology graduates capable of developing devices and artefacts able to monitor, measure, model and control environmental impact, including monitoring and managing energy generation from renewable sources, and developing novel energy generation technologies.[4]

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Appropriate technology is a movement (and its manifestations) encompassing technological choice and application that is small-scale, affordable by locals, decentralized, labor-intensive, energy-efficient, environmentally sustainable, and locally autonomous.[1][2] It was originally articulated as intermediate technology by the economist Ernst Friedrich "Fritz" Schumacher in his work Small Is Beautiful. Both Schumacher and many modern-day proponents of appropriate technology also emphasize the technology as people-centered.[3][4]

Appropriate technology has been used to address issues in a wide range of fields. Well-known examples of appropriate technology applications include: bike- and hand-powered water pumps (and other self-powered equipment), the bicycle, the universal nut sheller, self-contained solar lamps and streetlights, and passive solar building designs. Today appropriate technology is often developed using open source principles, which have led to open-source appropriate technology (OSAT) and thus many of the plans of the technology can be freely found on the Internet.[5][6] OSAT has been proposed as a new model of enabling innovation for sustainable development.[7][8]

Eco-innovation is the development of products and processes that contribute to sustainable development, applying the commercial application of knowledge to elicit direct or indirect ecological improvements. This includes a range of related ideas, from environmentally friendly technological advances to socially acceptable innovative paths towards sustainability. The field of research that seeks to explain how, why, and at what rate new "ecological" ideas and technology spread is called eco-innovation diffusion.[5]

Ecotechnology is an applied science that seeks to fulfill human needs while causing minimal ecological disruption, by harnessing and manipulating natural forces to leverage their beneficial effects. Ecotechnology integrates two fields of study: the 'ecology of technics' and the 'technics of ecology,' requiring an understanding of the structures and processes of ecosystems and societies. All sustainable engineering that can reduce damage to ecosystems, adopt ecology as a fundamental basis, and ensure conservation of biodiversity and sustainable development may be considered as forms of ecotechnology.

Ecotechnology emphasizes approaching a problem from a holistic point of view. For example, remediation of rivers should not only consider one single area. Rather, the whole catchment area, which includes the upstream, middle stream and downstream sections, should be considered.[6]

Construction can reduce its impact on nature by consulting experts on the environment.

Sustainable development requires the implementation of environmentally friendly technologies which are both efficient and adapted to local conditions. Ecotechnology allows improvement in economic performance while minimizing harm to the environment by:[1]

- increasing the efficiency in the selection and use of materials and energy sources
- control of impacts on ecosystems
- development and permanent improvement of cleaner processes and products
- eco-marketing
- introducing environmental management systems in the production and services sectors
- development of activities for increasing awareness of the need for environmental protection and promotion of sustainable development by the general public[7]

Environmental Technology Verification (ETV) consists of the verification of the performance of environmental technologies through testing using established protocols or specific requirements.[1] This process is carried out by qualified third parties, and several ETV programs are being run worldwide. These programs are organized through government initiatives, with the United States of America and Canada being among the pioneers. Other programs are being run in South Korea, Japan, Bangladesh, Denmark, France, Europe, the Philippines, and China.[2][3] However, it is worth noting that each program has its own definitions, structure and procedures, and they are not always programs are not always compatible with one another.[4] In 2007, an ETV International Working Group was formed to work on the convergence of the different programs towards mutual recognition. The group's motto was Verified once, verified everywhere.[4] The group's work led to a request for drafting an ETV ISO standard, resulting in establishing an ISO working group under Technical Committee 207 (Environmental Management), Sub-committee 4, Working Group 5 - Environmental Technology Verification (ISO/TC 207/SC 4/WG 5).[5] The ISO standard will have the number ISO/NP 14034 once completed.[1]

III.RESULTS

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Information and communication technologies for environmental sustainability (ICT Ensure) is a general term referring to the application of information and communication technologies (ICTs) within the field of environmental sustainability. Information and communication technologies are acting as integrating and enabling technologies for the economy and they profoundly affect our society. Recent changes in ICT use globally have damaged the environment (in terms of waste and energy consumption etc.) but also have the potential to support environmental sustainability activities,[1] such as the targets set within the Millennium Development Goal (MDG) number 7 (MDG7) to "ensure environmental sustainability".[2]

New technologies provide utilities for knowledge acquisition and awareness, early evaluation of new knowledge, reaching agreements and communication of progress in the interest of the human welfare. This includes ethical aspects of protecting human life as well as aspects of consumer safety and the preservation of our natural environment.[8]

Environmentally sustainable design (also called environmentally conscious design, eco-design, etc.) is the philosophy of designing physical objects, the built environment, and services to comply with the principles of ecological sustainability and also aimed at improving the health and comfort of occupants in a building.[1][2] Sustainable design seeks to reduce negative impacts on the environment, the health and well-being of building occupants, thereby improving building performance. The basic objectives of sustainability are to reduce the consumption of non-renewable resources, minimize waste, and create healthy, productive environments. Sustainable engineering is the process of designing or operating systems such that they use energy and resources sustainably, in other words, at a rate that does not compromise the natural environment, or the ability of future generations to meet their own needs.[9]

Sustainable development is an organizing principle that aims to meet human development goals while also enabling natural systems to provide necessary natural resources and ecosystem services to humans. The desired result is a society where living conditions and resources meet human needs without undermining the planetary integrity and stability of the natural system.[2][3] Sustainable development tries to find a balance between economic development, environmental protection, and social well-being. The Brundtland Report in 1987 defined sustainable development as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs".[4][5] The concept of sustainable development nowadays has a focus on economic development, social development and environmental protection for future generations.[10]

Sustainable development was first institutionalized with the Rio Process initiated at the 1992 Earth Summit in Rio de Janeiro. In 2015 the United Nations General Assembly (UNGA) adopted the Sustainable Development Goals (2015 to 2030) and explained how the goals are integrated and indivisible to achieve sustainable development at the global level.[6] The UNGA's 17 goals address the global challenges, including poverty, inequality, climate change, environmental degradation, peace, and justice.[11]

Sustainable development is interlinked with the normative concept of sustainability. UNESCO formulated a distinction between the two concepts as follows: "Sustainability is often thought of as a long-term goal (i.e. a more sustainable world), while sustainable development refers to the many processes and pathways to achieve it."[7] The concept of sustainable development has been criticized in various ways. While some see it as paradoxical (or as an oxymoron) and regard development as inherently unsustainable, others are disappointed in the lack of progress that has been achieved so far.[8][9] Part of the problem is that "development" itself is not consistently defined[12]

The All-Earth Ecobot Challenge (or Ecobots) is a competition that occurs yearly for students throughout Texas in grades 5–8 that started in 2009 (14 years ago). It encourages students to be creative, learn more about robots, learn about the environment and how to help protect it, and prepares them for future jobs. The Ecobot Challenge uses various Lego pieces, Lego NXT sets, and PowerPoint. WIPO GREEN is a World Intellectual Property Organization program[1][2][3] that supports global efforts to address climate change and food security through sharing of sustainable technology innovations . WIPO GREEN was established in 2013, it is a free online marketplace for technology exchange connecting providers and seekers of inventions and innovations in environmental technology.[13] WIPO GREEN acts as platform for innovators, small and medium enterprises, Fortune 500 companies, and other key stakeholder to take part in green technology innovation and increase diffusion with the help of intellectual property rights through services such as the database, network, and projects. Under the management of WIPO's Global Challenges Division,[4] WIPO GREEN consists of three main elements:

1) The online database of sustainable technologies uploads and needs,

2) Acceleration Projects and

3) The WIPO GREEN partners network.[5]

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Clean technology, in short cleantech, is any process, product, or service that reduces negative environmental impacts through significant energy efficiency improvements, the sustainable use of resources, or environmental protection activities. Clean technology includes a broad range of technology related to recycling, renewable energy, information technology, green transportation, electric motors, green chemistry, lighting, grey water, and more. Environmental finance is a method by which new clean technology projects can obtain financing through the generation of carbon credits. A project that is developed with concern for climate change mitigation is also known as a carbon project.[14]

IV.CONCLUSIONS

Green computing, green IT (Information Technology), or ICT sustainability, is the study and practice of environmentally sustainable computing or IT.

The goals of green computing are similar to green chemistry: reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, increase the recyclability or biodegradability of defunct products and factory waste. Green computing is important for all classes of systems, ranging from handheld systems to large-scale data centers. Many corporate IT departments have green computing initiatives to reduce the environmental effect of their IT operations.[1] Yet it is also clear that the environmental footprint of the sector is significant, estimated at 5-9% of the world's total electricity use and more than 2% of all emissions.[2] Data centres and telecommunications will need to become more energy efficient, reuse waste energy, and use more renewable energy sources to stay competitive. Some believe they can and should become climate neutral by 2030.

Energy Saving Modules (ESM) reduce the electricity consumption (kWh) and maximum demand (kW) of air conditioning and refrigeration compressors. The concept was developed in Australia in 1983 by Abbotly Technologies and is now distributed by Smartcool Systems Inc.[1] The system works in conjunction with existing HVAC controls ensuring that compressors work at maximum efficiency, while maintaining desired temperature levels. By preventing over-cycling, known as 'Compressor Optimisation' consumption of electricity is cut by between 15% and 25%.Green development is a real estate development concept that considers social and environmental impacts of development. It is defined by three sub-categories: environmental responsiveness, resource efficiency, and community and cultural sensitivity. Environmental responsiveness respects the intrinsic value of nature, and minimizes damage to an ecosystem. Resource efficiency refers to the use of fewer resources to conserve energy and the environment. Community and cultural sensitivity recognizes the unique cultural values that each community hosts and considers them in real estate development, unlike more discernable signs of sustainability, like solar energy, (solar panels are more visibly "green" than the use of local materials). Green development manifests itself in various forms, however it is generally based on solution multipliers: features of a project that provide additional benefits, which ultimately reduce the projects' environmental impacts.[15]

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Impact Factor: 7.580

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