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Environmental Regulations in Computing: Policies and Practices

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Abstract: In an era where environmental concerns are vital and people are fighting to save environment, Green Information and communication Technology appears as a miraculous boon for the World. Green ICT talks about uses of technology in environment friendly way. Information and communication technology (ICT) plays continuously a vital role in encouraging sustainability. Green ICT, or Green Information and Communication Technology, is creating, utilizing, and disposing of ICT resources in an environmentally sustainable manner. This includes lowering energy use, eliminating electronic waste, and leveraging technology to encourage sustainable behaviours across multiple sectors. The government has made various policies for the use of ICT in environment friendly way. This paper examines the Environmental policies and practices that are implemented to ensure the protection and preservation of the environment in relation to computing activities..

Keywords: *Computing service, Communication Technology, Environmental Policies and Green ICT.*

1. Introduction

In modern time we cannot imagine our life without Internet. each of our action affects environment. The demand for digital technology is robust as a result of the widespread availability of streaming services, continuous technological breakthroughs, and the global pandemic ICT is widely seen as a valuable instrument for addressing environmental issues[1]. However, there is evidence suggesting that ICT also has detrimental impacts on the surroundings. According to estimates, ICT (Information and Communication Technology) is accountable for generating and spreading around 2% of CO_2, that is exactly 861 million tonnes. Moreover, the chemical substance constituents of non-functional ICT instrumentals inflict significant harm on air, water and soil [2-5]. In addition, the epoch-making rise in quantity of radio spars and continuous emission of electromagnetic waves contaminate our surroundings and affects the whole biosphere [6-9]. Due to the advancement of ICT infrastructures and facilities, as well as the growing public awareness regarding environmental preservation and sustainable development, there has been a significant increase in the focus on green ICT [10-11]. Green ICT refers to the scientific exercise of creating, producing, using, and recycling laptops, printers, database servers, immobile and portable communication devices, and their related systems in a way that minimizes negative impacts on the environment [12]. Green ICT refers to the ability to enforce policies that address environmental standards related to the design, manufacture, usage, and disposal of ICT goods. The goal is to minimize the negative impact on the environment [13]. The primary principles associated with green ICT are environment friendly manufacture and design, green usage, and green disposition [14]. Green ICT has the potential to generate favourable environmental and economic outcomes by enhancing energy efficiency, decreasing greenhouse gas emissions, limiting the utilization of hazardous compounds, and promoting the reprocess and utilization of electronic trash [15]. Governments of different countries are endeavouring to enhance their environmental demonstration by implementing specific laws and efficient programmes related to green ICT. The emission of Carbon by ICT is shown in Fig.1.

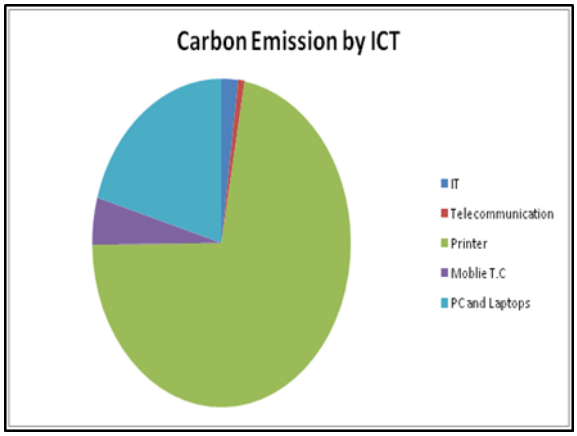

Fig 1. Showing Carbon Emission by different Sectors

2. Material and Methods

A survey was conducted among IV and VI Sem BBA students at MMDU Mullana, Ambala. A precise questionnaire was distributed to target consumers to gather thorough and under consideration data about Green ICT. A questionnaire of 30 questions was provided to students. We received 75% of completed questionnaires.

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Table 1. Related work developed by various researchers.

Study	Literature Review
Siegler & Gaughan, 2008 and Chaudhari, 2011 (19)	Green IT encompasses the implementation of projects and programmes within the field of ICT and systems that specifically target environmental sustainability.
Chaudhari, 2011 (19)	Green IT has the ability to mitigate the environmental consequences through both direct and indirect means. Enhanced materials and technologies can be employed in the production of IT components, resulting in more energy-efficient IT equipment and infrastructure. This helps minimize the direct environmental impact. Additionally, the development of more effective accumulation systems and technology statements can help business ti initiate in reducing indirect and negative environmental effects.
Council of European Professional Informatics Societies, 2015 in Thongmak, 2016 [20]	The field of study and application focused on the efficient and effective design, production, utilisation, and disposal of computers, servers, and related components, including personal computers, printing devices, entrepot inclination, networking, and communicating systems, with the goal of minimising or eliminating any negative influence on the environment.
(Singh & Singh, 2017) [21]	The fundamental components of ICT include personal computers, servers, cooling systems, fixed and mobile communications gadgets and connections, local area networks, work systems for communication, and printing devices. The topics covered in the text include eco-friendly hardware, automatic power control programmes, virtualization of servers, PC selection, thin client solutions, incorporated telephony, efficient storage systems, and digital office solutions.

3. Sustainable Digital Transformation in Organization

Green (ICT) advert to an effort to promote the usefulness of ICT by single person, groups, stakeholders, and organizations to address environmental issues and develop solutions for them. Green ICT involves the innovative management of ICT systems with a focus on environmental sustainability [15]. From an organizational perspective, it is logical to consider Green ICT as the tangible influence of ICT on the planet's health. Green ICT is also associated with cost efficiency, rendering it beneficial for the environment. Green ICT mentions the practice of developing and utilizing the hardware and software that have minimal impact on the environment, as well as utilizing ICT to examine and understand the environmental issues[16]. The goal is to extenuate the antagonistic effects of ICT on the bio-spherical surroundings and promote the development and use of apps devoted to environmental protection.

To implement Green ICT, certain organizations have adopted standards for environmental management (EMPs). These practices encompass a range of activities such as conducting environmental audits, implementing total cost accounting and overall quality establishment, developing plans to forestall environment, stipulating environmental activitiesfor employees, conducting existence cycle investigation, investing in research and development (R&D), setting environmental modular for traders, and implementing the motivational programme for workers to encourage suggestions for neat and clean environment [17]. Green ICT creation and deployment in organizations, as well as its usage by individuals, offer several direct and indirect benefits, shown in Fig.2.

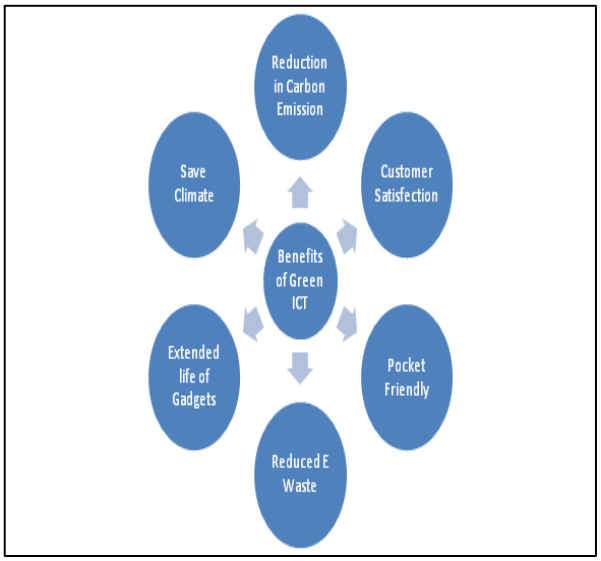

Fig 2 To Do's to save Environment

3. Barriers in Implication of Green Information and Technology

In recent years, global warming and environmental degradation have emerged as significant concerns in society and have become widely discussed topics on a global scale. Green ICT promotes and facilitates environmentally friendly behaviour among a country's population. Through a combination of methods such as awareness campaigns, continuous education, and, in certain instances, laws, it is possible to alter the entire

culture of any given organization [18]. The Green ICT policy facilitates compliance with environmental laws and government regulations, serving as a blueprint for the effective implementation of sustainable practices.[19]The restrictions that hinder the adoption of Green ICT are recognised and stated in table 2.

Table2. Obstacle in the implementation of Green ICT in India

S. No	Reasons of Barrier	Accepts	Don't know	Reject
1	Lack of Motivation	64%	11%	25%
2	Inadequate awareness of the latest advancements in technology.	75%	12.5%	12.5 %
3	Insufficient engagement in research and development endeavours	61%	15%	14%
4	Insufficient government regulation about Green ICT	80%	15%	5₹
5	Inadequate planning for the deployment of green ICT.	48%	21%	31%
6	There is no provision of funds for the implementation of environmentally friendly information and communication technology (ICT).	78%	11%	11%
7	Disinterested in ICT seminars for knowledge enhancement.	55%	15%	30%
8	Insufficient skilled or educated workforce.	40%	32%	28%

The study solely focused on a few constraints stated above that were regarded significant obstacles to the successful implementation of Green practices. Administrative personnel are just beginning to recognize the importance of Green ICT as a critical field [20]. The concealed energy expenses often elude the administration's awareness, as they may lack knowledge of the extent of energy use in their operations and may not be interested in monitoring the electricity bill associated with energy expenditures [21]. The idea of level of Pollution by carbon emission in different countries is shown in Table 3 and table 4 shows carbon emission from popular activities.

Table3. Percentage of Carbon Emission: five different countries.

S.NO	Country	No of ICT users	Carbon Emission%
1	China	854 Million	27%
2	India	570 Million	6.08%
3	US	315 Million	16%
4	Indonesia	175 Million	1.5%
5	Brazil	150 Million	1.4%

Table4. Carbon Emission by popular ICT tools

Platforms	Users	Emission
Youtube	1 billion hr watched	6 billion gram
google search	3.5 billion search	700 million gram
Face book	1.7 billion	1.3 billion gram
Ticktok	2.63 bg per min	4800 er use

5. Policies for Green ICT

The main aim of Green ICT is to minimize energy use, carbon emissions, waste generation, material usage, and space requirements, while simultaneously enhancing process efficiency and cost savings. The following guidelines outline the recommended practices for obtaining, utilising, and discarding ICT devices [22].

- The main aim of Green ICT is to minimize energy use, carbon emissions, waste generation, material usage, and space requirements, while simultaneously enhancing process efficiency and cost savings. The following guidelines outline the recommended practices for obtaining, utilising, and discarding ICT devices[22].

- Choose a monitor that is appropriately sized to conserve energy, as larger monitors require more electricity than smaller ones.
- To conserve space and energy, go for multifunctional equipment that can handle jobs such as photocopying, imaging, faxing, and printing, instead of using separate devices for each purpose.
- Choose items that are equipped with an integrated auto-sleep mode feature. This will decrease the amount of power used.
- When acquiring new ICT equipment, one should evaluate the total cost of ownership. This includes calculating the costs associated with the lifespan of the equipment, such as the purchase price, consumption of energy and predicted usage profile, maintenance costs, and service costs. These factors should be taken into account when comparing different products. Additionally, it is important to consider the recycling and disposal obligations for equipment that is no longer functional when selecting a product [23].
- To minimise electricity consumption, it is advisable to switch to laptops or thin clients whenever suitable. Additionally, consider opting for freshly designed desktop computers that utilise the same components as laptops [24].
- Whenever appropriate, including "adherence to applicable green standards" as a tender requirement. Opt for environmentally compliant products in green whenever feasible. Select environmentally conscious vendors whenever possible [25]. Few ways that can help to save environment are shown in fig 3.

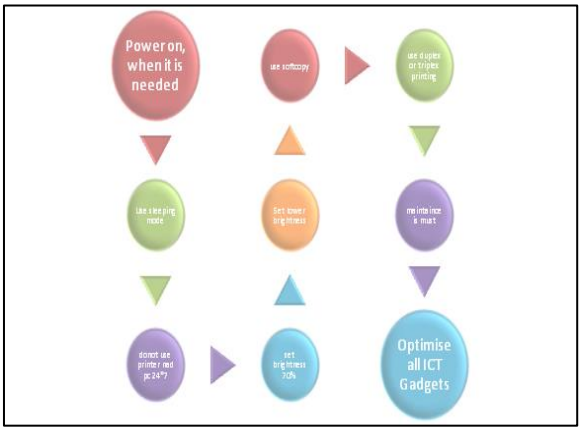

Fig 3. Ways to prevent Environment.

4. Conclusion

The key to future prosperity lies in investing in environmentally sustainable ICT. An increasing number of ICT vendors and customers are embracing green ICT, so contributing to the establishment of a sustainable society and economy. When companies face increased environmental taxes and regulations, they will priorities the adoption of green ICT solutions.

Currently, the world is confronted with numerous crises and issues that are interconnected. It is imperative to make concerted efforts to ensure that ICT sets a precedent and minimizes its energy use in organizations. This study examined eight obstacles in the enforcement of Green ICT in different sectors. The respondents identified the lack of rigorous government regulations as the primary hurdle to implementing eco-friendly ICT. The research also recommends further enhancements to the quality of the ICT technical workforce and training programme. Furthermore, the report suggests allocating a specific budget for the enhancement of technology relevant to the green environment. The majority of the identified barriers are reliant on individuals, therefore, in order to expedite the deployment of green ICT, these barriers must be addressed.

In order to utilise the latest ICT innovation, an organisation must have knowledge about the products they are acquiring. By prioritising aspects such as energy-efficient hardware and the overall components of a computer, it is possible to significantly reduce the amount of power consumed on a daily basis. Successfully replacing outdated hardware with newer and more efficient equipment is only beneficial if there is a significant increase in production and if the old equipment can be salvaged or repurposed rather than being discarded in a landfill. People uses GICT are shown in Fig4.

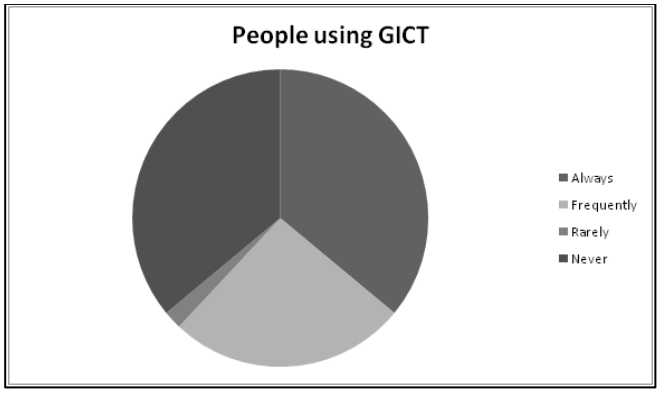

Fig 4. People are using Green ICT.

The concept of 'Being Green' should be interpreted as a sustained dedication to addressing the underlying drive to create a more environmentally friendly and cost-effective framework. Several organizations have recently started disclosing the amount of money they saved in a calendar year by adopting practical environmentally friendly methods. Organizations that are inexperienced in adopting environmentally friendly practices should seek the guidance of efficient models to establish a list of actions that are best suitable for their specific needs. Furthermore, the findings of this study might serve as a guide for the

organization's key decision-makers in creating a more conducive and amicable work environment. Moreover, they can utilise the precise factors identified by the organization's strategies to make decisions regarding the deployment of environmentally-friendly information and communication technology (ICT). It is crucial to acknowledge that the outcomes of adopting green ICT are not instantaneous, encompassing both financial and environmental advantages. Hence, in addition to logical considerations, the values and motives of the top decision maker in an organisation play a crucial role in the adoption of green ICT.

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