Green Information Infrastructure: Stakeholders-A Study

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Abstract:-
Infrastructure of the Green Information is an extension of the Green Computing and Technology. Green Information and Communication Technology is the study and practice of sustainable computing or Information Technology. Green Computing, Green Technology, and Green ICT are responsible for healthy and sustainable environmental practice. It includes activities like Green Disposal, Modelling, and Green Product Development. As San Murugesan mentioned, ‘Green Computing’ is a study and disposing of computers, servers and associated sub systems such as monitors, printers, storage devices and networking and communication systems efficiently and effectively. The development and extension of The Green Computing bring a new concept i.e. Infrastructure of The Green Information, which is mainly responsible for designing and development of Green and Eco-Friendly Information Systems and Infrastructure. This paper discusses The Green Information Infrastructure with particular emphases on its nature, role and its stakeholders and components.

Keywords:-
Green Science and Technology, Green Computing, Green IT, Green ICT, Green Information Infrastructure, Green Information Science, Eco-Friendly, Green Society, Energy Consumption, Power Management

Introduction:-
Green Computing and its application in information world are termed as The Green Information Systems. The extended domain of The Green Information Systems that includes design, development, modernization and upgradation of Information Systems based on The Green Computing and IT principles, is termed as The Green Information Infrastructure. The Green Information Infrastructure covers a large domain of information mechanism run on eco friendly platform and strategies. The Green Computing and Green IT evolved during the 1980s; though as a concept, it was restricted to private organizations and scientific laboratories during its inception. Over the years, the awareness on long-term harmful effects of IT and Computing increased the uses and awareness of The Green IT around the world. Large-scale uses of GICT by domestic, public, and private entities are one of the major causes of Carbon emission. Green Information Infrastructure promotes various strategies for healthy Green Technology and efficient utilization of energy in the field of Information Science [22].

Objectives:-
The main aim and objective of this study include the following activities.

Fig: 1- Depicted Green Technology and its contribution in Information world
To learn about the Green Computing and its characteristics;
To learn about The Green Information Infrastructure and its requirement for healthy Eco-Friendly Environmental Information Systems building;
To learn about Information Infrastructure and its role;
To identify the attributes that play important roles for The Green Information Systems building;
To learn about the deployment, optimization, power management, material cycling, Tele-Conferencing and so on;
To find out main challenges and issues before The Green Information Systems.

**Information Infrastructure: Basics:-**
Information Infrastructure is the periphery of a broad spectrum of information institutions and information systems. Fundamentally, Information Infrastructure is responsible for information dealing; which includes processes like collection, selection, organization, processing and management [23, 24]. In simple way, we may say that, Information Infrastructure concerns the entities, facets, organization, tools, techniques and systems which deal with information and knowledge. Academic institutions such as colleges, universities, schools, and training centres are the largest stakeholders of information. They depend on Information Infrastructure that includes libraries, information centres, data centres, information kiosks and information systems and technological entities like Mobile Systems, E-Learning, Information Networks, Telecommunication Networks and so on.

**Green Information Infrastructure: Building:-**
Green Information Infrastructure is an integration of The Green Computing applications in Information Infrastructure and similar establishments and institutions. Green Information Infrastructure relies on Green and Eco Friendly Information Systems and their constituent components such as computers, printers, routers, switches and networking devices. Basic principles of such systems include efficient usage of energy, less carbon emission, and adherence to other Green Science and Technology principles [34, 25]. Green Information Infrastructure is a fairly new concept that has huge academic potentials as well.

![Diagram](image_url)

**Fig: 2-**Shows the areas where application of Green Computing or allied technology is possible

**Green Information Infrastructure: Some essential Requirement:-**
Green Information Infrastructure is primarily needed for healthy practice of information science. The uses of Green Computing in Information Systems and Information Infrastructure lead to some other concepts like Green Modeling and Green Designing. Green Information Systems and Networks are needed for following purposes.
- Utilization of energy efficient and less power consuming Computers and peripherals.
- Purchase of computers and machines based on Green Modeling and Designing that have the energy labeling;

- Efficient material re-cycling, power management, Cloud Computing, and allied technological promotions in Information and Data Centres and Systems[30];
- Implementation of The Green Computing and Green Technology based equipment and peripherals in foundational Information Systems and Networks. They should be consistent with multiple information entities like Data Centre, Documentation Centre and other allied entities that use Computers, electronic devices, and electronic technologies;
- Responsible use of the Green Information Infrastructure for Eco friendliness, energy efficiency, less carbon emission, and less hazardous wastes[25];
- Transparent, fast, and effective communications between entities based on Cloud Computing and virtualization principles.

**Green Information Infrastructure: Stakeholders:-**

Pertinent stakeholders and components in the Green Information Infrastructure include the domain of Information Science tools and technologies, knowledge, and content. Information Science and Foundations: Information Science covers various interrelated fields of information activities ranging from collection, selection, organization, processing, management, and dissemination of information. Information Science incorporates the activities of several Information Foundations such as Information Centre, Documentation Centre, Data Centre, Libraries, and Referral Centres [22].

![Fig: 3- Showing the main components of Green Information Infrastructure](image)

These centres deploy several tools and technologies such as computer networking, database technologies, web technologies, communication systems and so on. These technological constituents depend on some tools, devices, and equipments and it is possible to use the Green Computing and Technology based Infrastructure in this area [23].

Green Computing and Technologies: Green Computing and Technologies calls for efficiency and sustainability in energy consumption, material cycling, power management, virtualization promotion, ergonomics, and promote the use of hazard free materials.

The Green Computing emerged during the 1980s and was gradually popularised around the world in the following decades. The creation of the ‘Energy Star’ logo design in 1992 is considered as an important
landmark in the Green Computing practices. Today several organizations and institutions around the world are shifting towards the Green Computing and Technological implementation. The Green Computing Techniques include the following [36].

- Better algorithm design to minimize energy consumption;
- Eco-Friendly environment to minimize carbon monoxide;
- Efficient use of power like turning off the computers, hardware and networks devices when not in use;
- It keeps all organization Green and Eco Friendly;
- Principle of minimum input and maximum output Technologies: Green Computing Techniques involves the following processes.

**Deployment Optimization:**
Design and development of algorithm, software and tools are to induce efficient energy and power management. Designs of all forthcoming computers and peripherals should be based on such technological systems.

**Resource Allocation:** Resource Allocation is an approach where route directions play an important role. It is feasible with advanced intelligent embedded systems and algorithm.

**Power Management:** This strategy is useful for saving power by implementing centralized operating systems and reducing number of computers and peripherals in the system. Liquid Crystal Display and low powered centralised graphic card are examples of other power management strategies [31, 36].

**Virtualization:** Virtualization is an important aspect of the Green Computing practice. Virtualization can reduce the use of software, hardware, tools, and techniques in the IT infrastructure using cloud computing architecture.

**Material Cycling:** Material cycling and recycling is another important approach of the Green Computing practice. Need based, timely and regular recycling may effectively reduce the pollution caused by harmful chemical components like lead, mercury, and hexavalent chromium.

**Tele Conferencing:** Tele conferencing is an important mechanism that promotes the Green Computing by saving energy used by VOIP;

**Information and Content:** Knowledge, Information and content are the integral components of the Information Infrastructure.

*The above mentioned techniques are considered as major components of the Green Computing and Green Information Infrastructure practice. Sophisticated Information Architecture, Resource optimization, and appropriate utilization of tools and devices in the working situation are some other important methods in this context.*
Findings:-
- Green Information Infrastructure and its awareness is still very limited with minimal utilization of the Green Computing concepts in the Government and private sectors;
- Green Information Systems is more popular than the Green Information Infrastructure;
- The Integration of the Green Computing and Information Science is often found to be difficult;
- Though information related academics like LIS, Information Science, and Computer Science are popular in Research Programmes, concerned departments are still reluctant about including the Green Information Infrastructure in their Bachelor and/or Masters level curriculum.

Suggestions:-
- Adequate awareness on the Green Computing, Green Information Infrastructure and Systems need to be initiated at the university, academic association, and environment level;
- Awareness on the Green Computing may be increased by promoting it as a specialized field of study in Degree programme;
- Rather than implementing it on individual computers, the design of the entire computer and information networks should be based on the Green Computing principles and practices. • Government agencies like the Planning commission and the IT ministry need to show due concern about Green ICT.

Conclusion:-
Green Computing is an important step towards overall societal development and a clean environment. Its benefits include saving energy, reducing carbon emission, and maintaining a clean environment. Green Information Systems and Green Information Infrastructure may fulfill the ultimate aims and objectives of Information Science. Government planning and interventions regarding healthy IT practice can play a crucial role to the success of these endeavours.

References:-