

GREEN IT :An Overview

Green It or Green computing is a

A branch of computer science .

It deals with efficient & effective usage of compute systems with less impact on environment.

Green House Effect

- **It is a natural process .**
- **Warms Earth's surface.**
- **When sun's energy reaches Earth's atmosphere ,some of it is refected back to space & rest is absorbed & re-radiated by green house gases.**
- **Green house gases include water vapour ,carbondioxide,methane,nitrous oxide,ozone & some artificial chemicals such as chloroflurocarbons(CFC's)**

- **This absorbed energy warms atmosphere & surface of earth.**
- **This process maintains Earth's temperature at around 33 degrees centigrade.**
- **Enhanced green house effect-**
- **Problem is that human activities –**
- **Such as burning fossil fuels (coal,oil & natural gas)agriculture & land clearing.**

Green House Effect

- **Step1:**Solar radiation reaches Earth's atmosphere-some of this reflected back into space.
- **Step2:**the rest of sun's energy is absorbed by land & oceans,heating the earth.
- **Step3:**Heat radiates Earth towards space.
- **Step4:**Some of this heat is trapped by greenhouse gases in the atmosphere ,keeping Earth warm enough to sustain life.
- **Step5:**Human activities such as burning fossil fuels,agriculture & land clearing are increasing amount of greenhouse gases released into the atmosphere.
- **Step6:**This is trapping extra heat,and causing Earth's temperature to rise.

Green House Gases

- **Green house gases are those that absorb & emit infrared radiation emitted by Earth.**
- **The important constituents are**
- **Carbon dioxide(CO_2)**
- **Methane**
- **Nitrous Oxide**
- **Chlorofluorocarbon(CFC)gases**

Common Characteristics Of Green House Gases are

- **They absorb heat emitted by Earth**
- **They re emit it back to earth surface increasing**
- **Earth's temperature**

BENEFITS OF GREEN COMPUTING

- **It improves energy efficiency**
- **Lowering GHG emission and carbon foot print**
- **Using less harmful materials for environment**
- **Encouraging reuse and recycling**
- **Reduction in power and resources consumption**
- **Better resource utilization**
- **Improved operational efficiency**
- **Total cost saving**
- **Meeting sustainable demands of customer and employees**

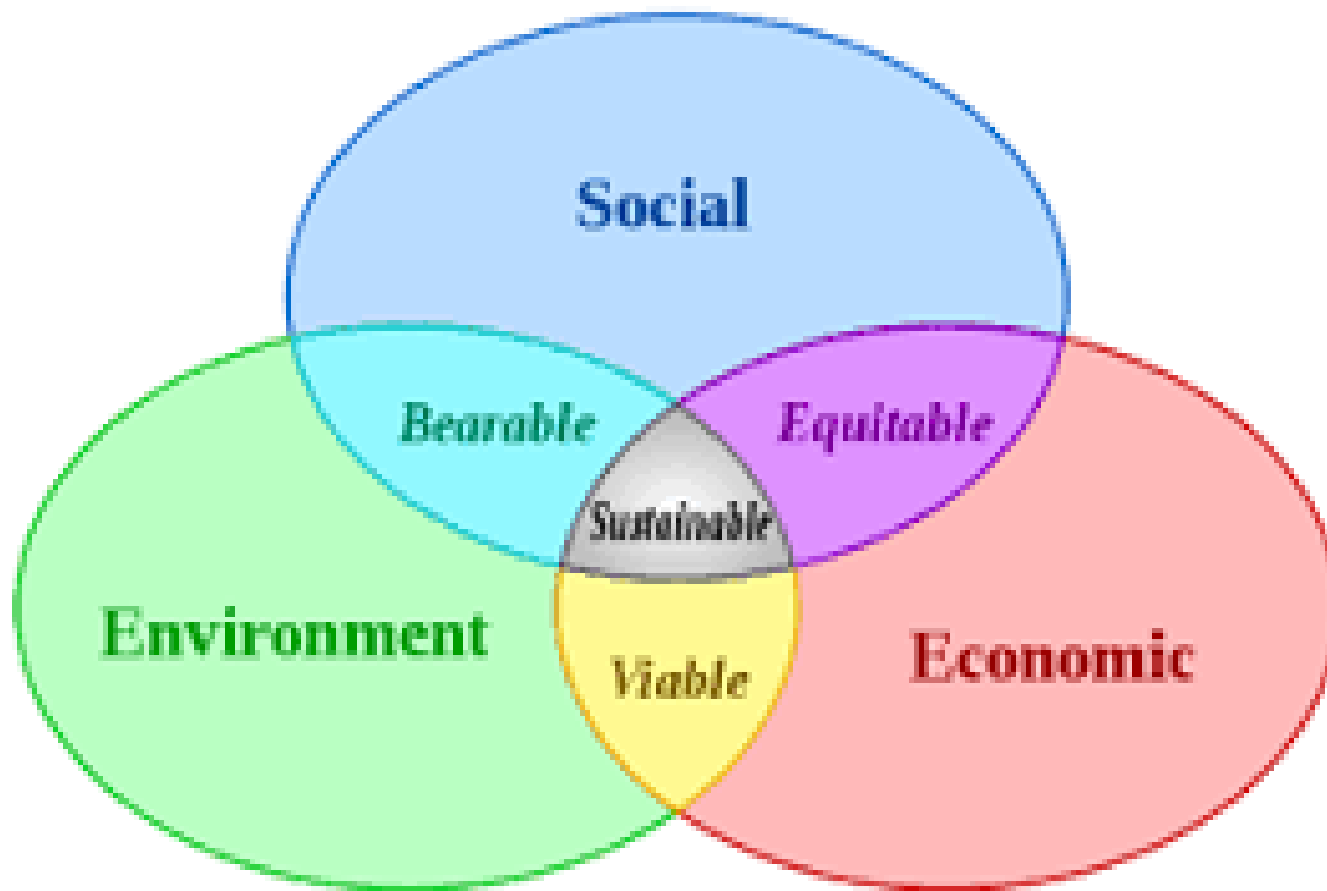
GREEN IT INCLUDES

- **Environmental Sustainability**
- **The economics of energy efficiency**
- **Increased awareness o the harmful effects of GHG emmissions**
- **New stringent environmental legislation**
- **Concerns about electronic waste disposal practices and corporate image concerns are driving business and individuals to go green**

ENVIRONMENTAL CONCERNS & SUSTAINABLE DEVELOPMENT

- **Global warming is an gradual increase in the temperature of the atmosphere near earths surface due to this there shall be changes in global climate patterns**
- **Global warming often refers to warming that can occur due to increased GHG emission from human activities which trap heat that would otherwise escape from earth. This effect is GREENHOUSE EFFECT**

SUSTAINABLE DEVELOPMENT



Continued...

- Sustainability is all about meeting needs of present and future and seeking balance between social, the environment and the economy
- Sustainable development is the development that meets
- The needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development comprises economic, environmental and social dimensions

WHY TO GO GREEN

- Increasing energy consumption and energy prices
- Consumer are interested in environmentally friendly friendly goods and services
- Highly expectations by the public on enterprises ,environmental responsibilities and emerging regulatory and compliance requirement
- Enterprise will increasingly feel the effects of environmental issues that impact their competitive landscape in ways not envisaged earlier

Continued..

- **Government agencies, investors and the public are demanding more disclosures from companies regarding their carbon footprint and their environmental initiatives and achievements**
- **Companies with the technology and vision to provide products and services that address environmental issues will enjoy a competitive edge**

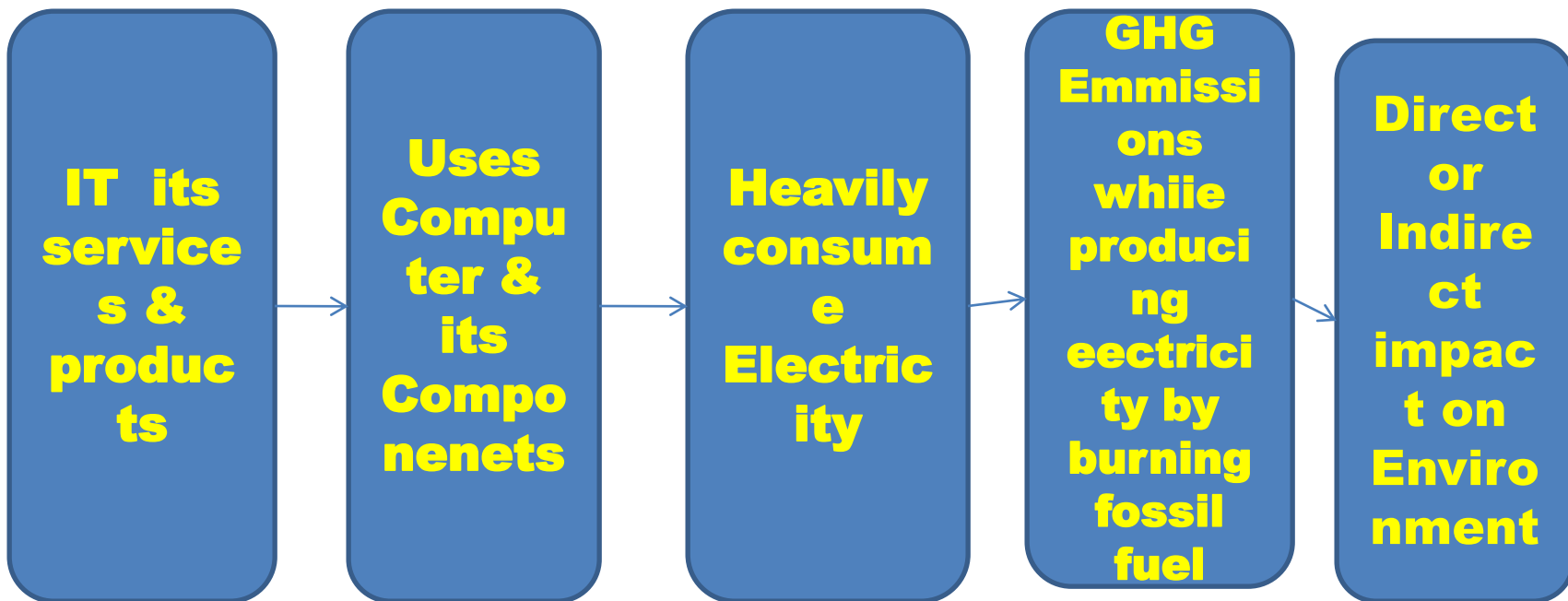
Environmental Impacts Of IT

IT uses computers & its components.

In lifespan of computers & its components

ie from production to disposal, it consume electricity, raw materials, chemicals & water & generate environment toxic materials.

All these directly or indirectly increase GHG emissions & impact environment.



Green IT

It refers to environmental friendly information technologies.

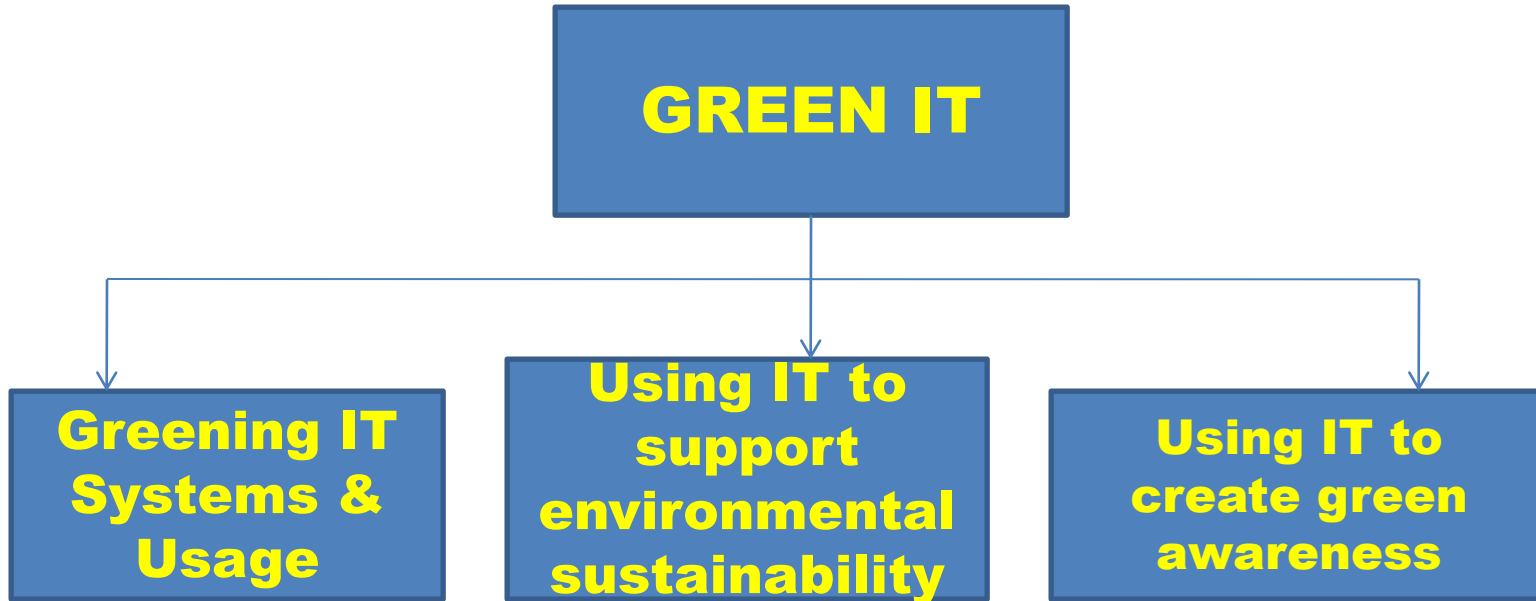
It is IT enabled approaches to improve environmental sustainability.

1.Efficient & effective usage of computer systems such that less impact on the environment.

2.Use of IT & IT systems to support environmental initiatives.

Green It helps to create awareness about green agenda & green initiatives.

Green IT dimensions



Green IT is also about application of IT to create energy efficient, environmental friendly sustainable business processes & practices.

As per 2020 report, IT's best influence is to enable energy efficiencies in other sectors.

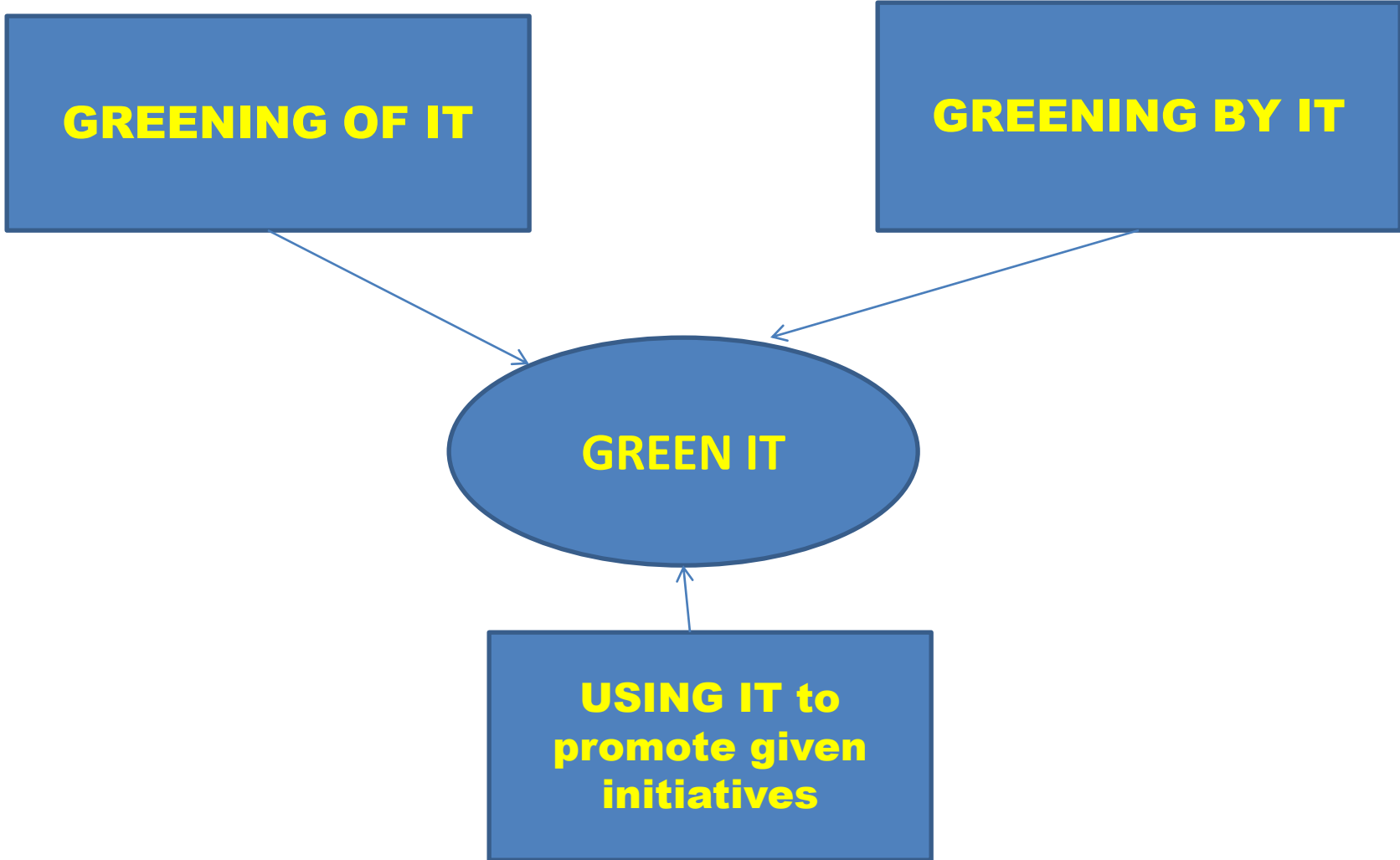
It deliver carbon savings five times larger than total emmissions from entire information & computer technology (ICT) sector in 2020.

GREENING OF IT

GREENING BY IT

GREEN IT

**USING IT to
promote given
initiatives**



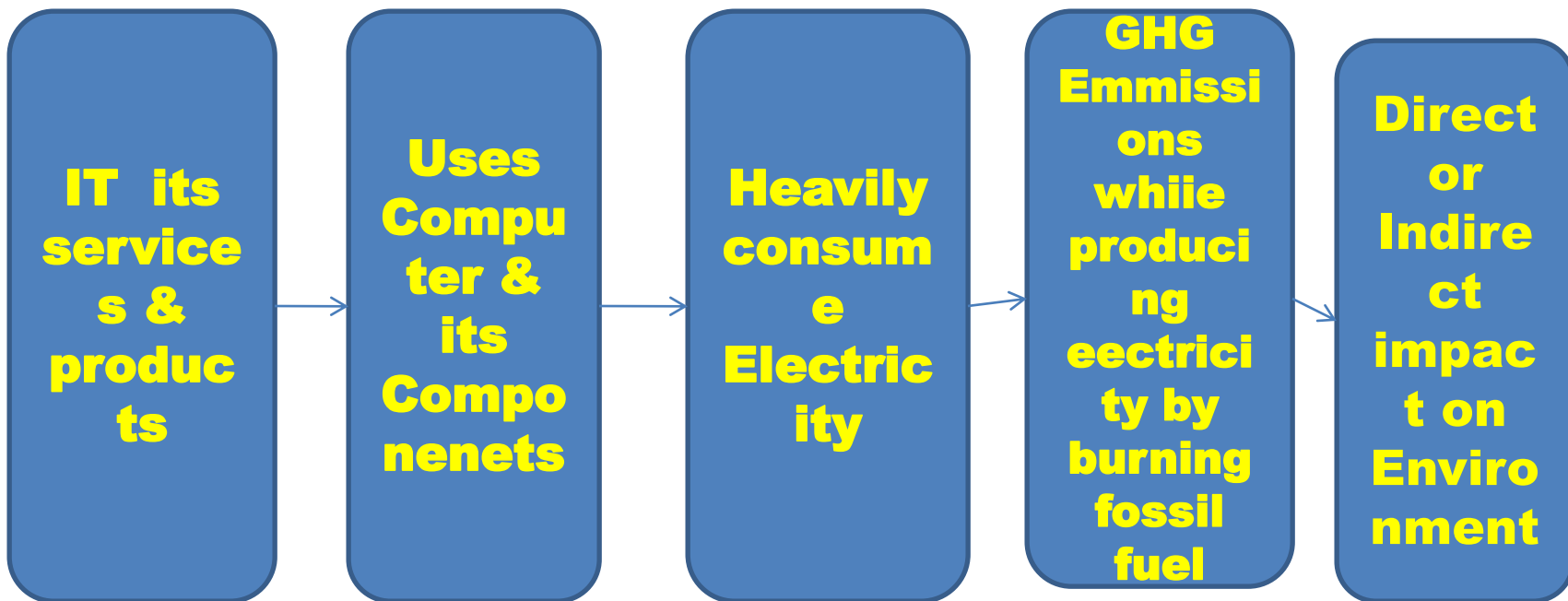
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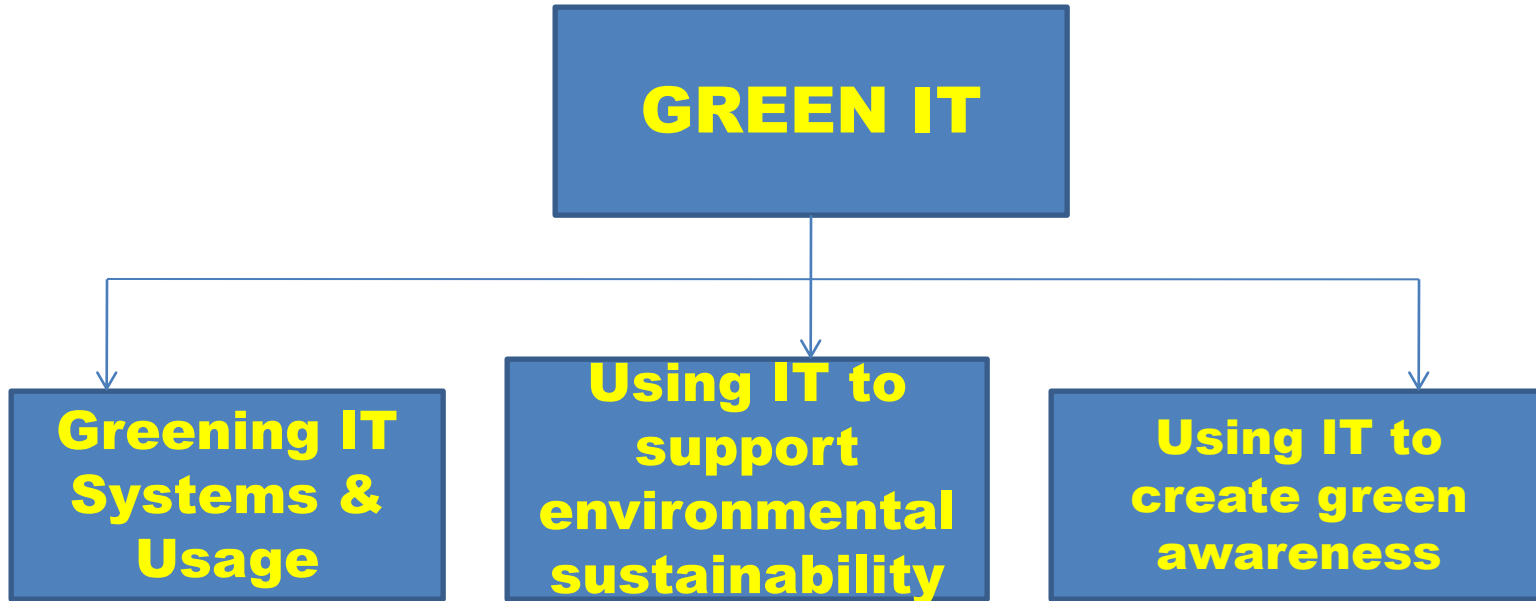
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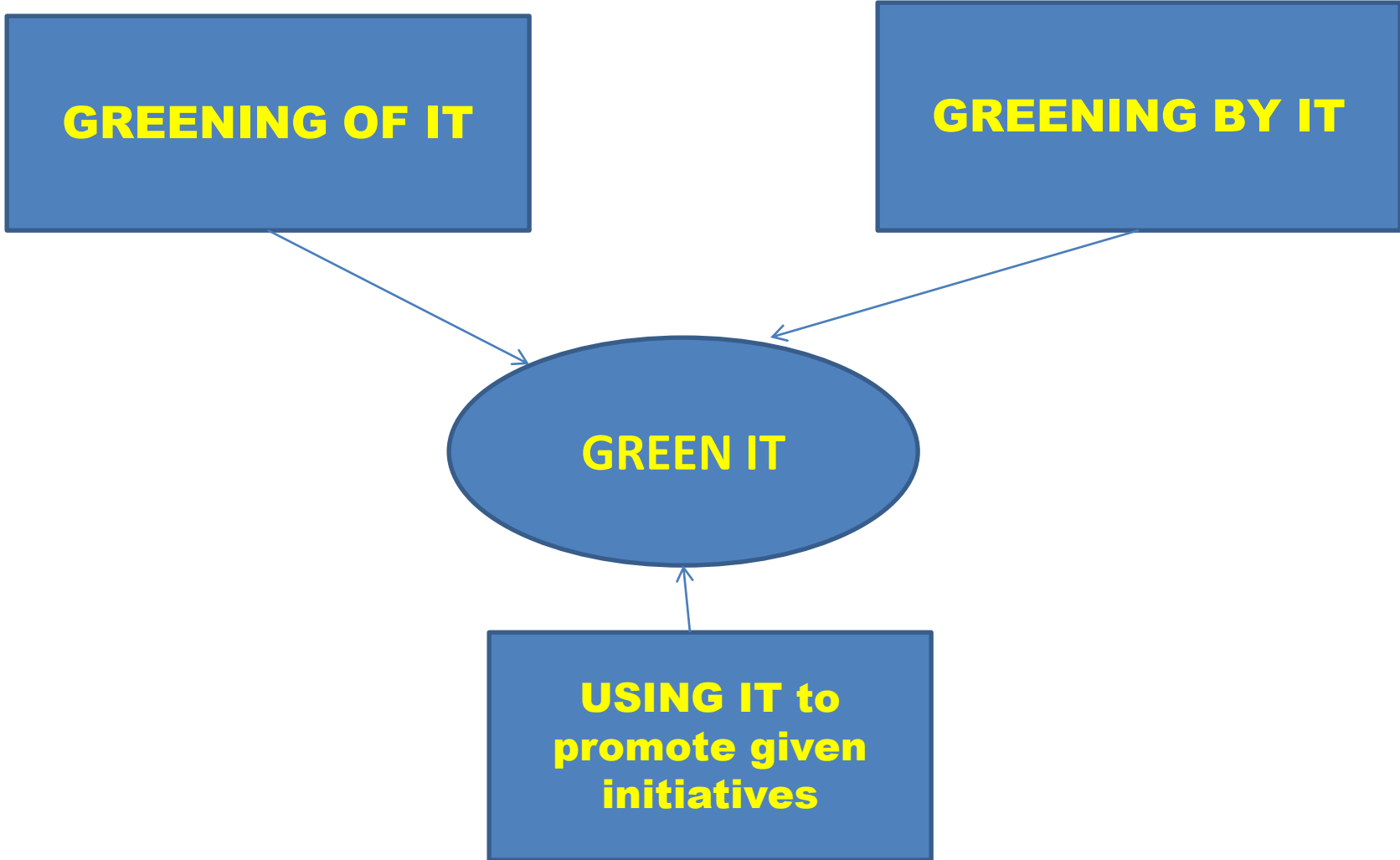
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OECD Green IT Framework

The organization for Economic Co-operation & Development proposed a green IT framework with three analytical levels.

Its objectives are same as Green IT dimensions.

Direct Impacts Of IT

- These are first order effects on the Environment
- It has both positive & negative impacts due to IT goods & services & processes.
- Sources of IT's direct impact on manufacturing & services of computers & its components used in IT solutions.

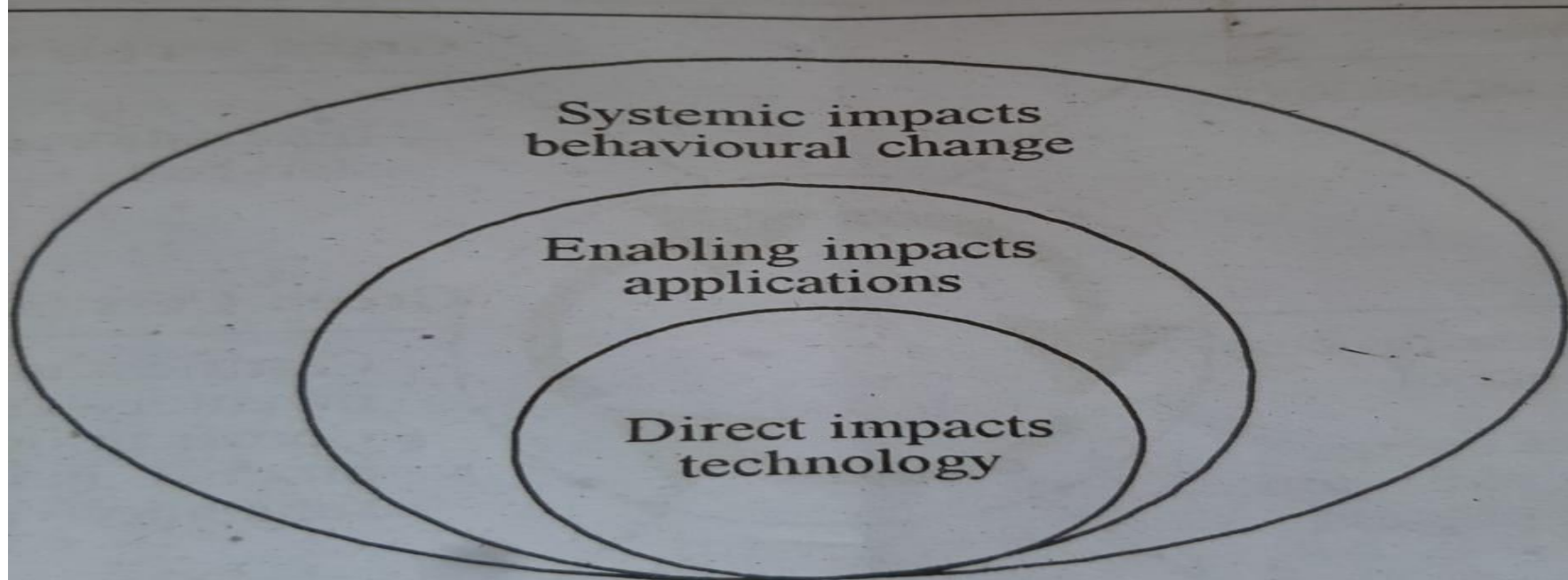
Enabling Impacts Of IT-

These are second order effects that arise from IT applications.

It reduces impact on environment in economic & social activities.

Systemic Impacts of IT-

These are third order effects which has change in behaviour process & non technological factors.



OECD green IT frame work
Fig. 1.6

Green It 1.0 and 2.0

1) Green IT 1.0: It focussed on reengineering IT products & processes to improve IT's energy efficiency.

2) Green IT 2.0:

1. It is focussed over a range of green initiatives to reduce impact on environment and reducing GHG emissions.

2. is pointed on major sustainability business models.

3. Coordinating, reengineering & optimizing supply chain, manufacturing activities & workflows of organization to reduce their environmental impact.

4. Providing platforms to eco management & emission trading.

5. Auditing & reporting energy consumption & savings.

6. Offer environmental knowledge management system & decision support system.

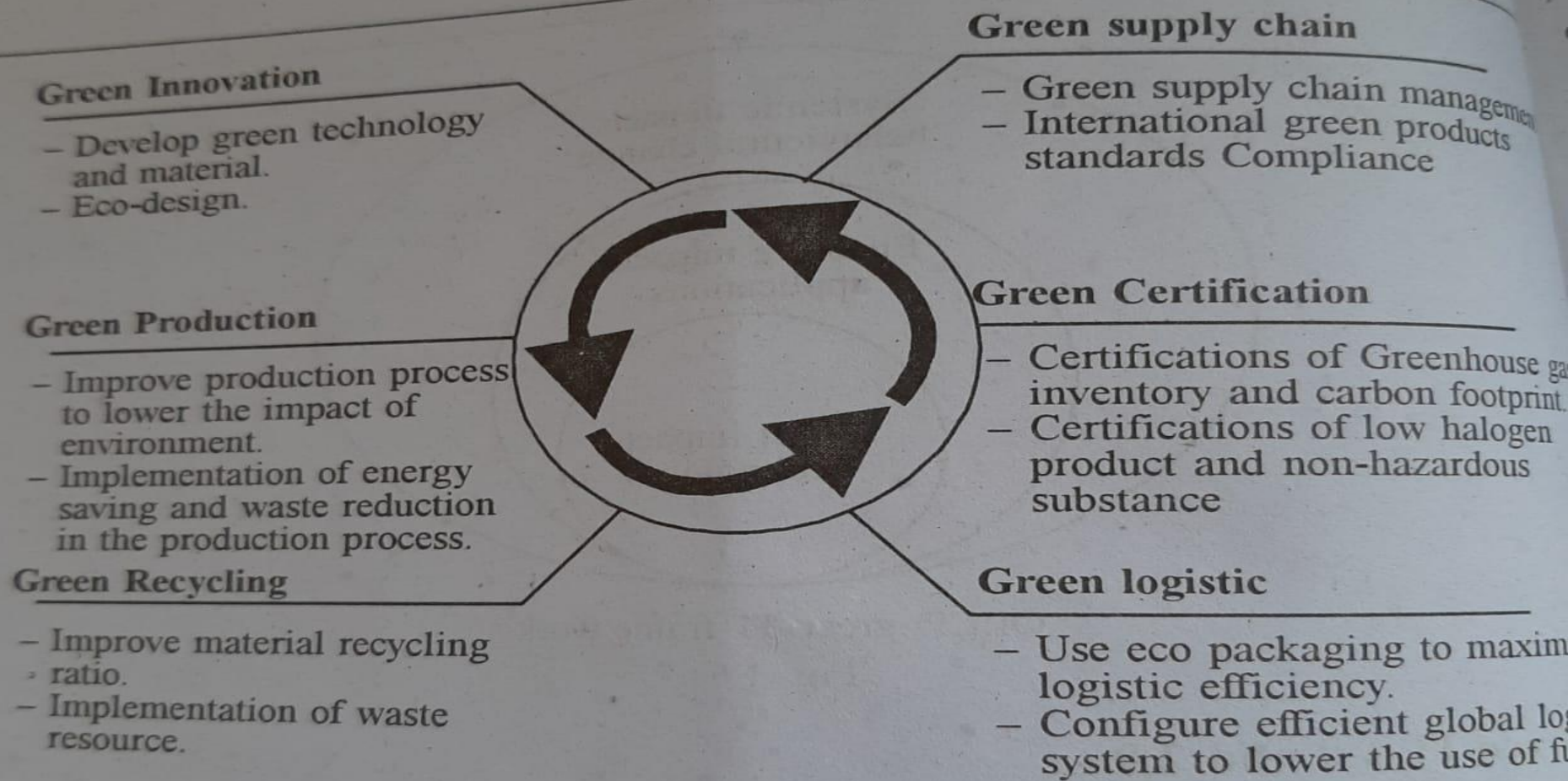


Fig. 1.7

Green Innovation

- Develop green technology and material.
- Eco-design.

Green Production


- Improve production process to lower the impact of environment.
- Implementation of energy saving and waste reduction in the production process.

Green Recycling

- Improve material recycling ratio.
- Implementation of waste resource.



Fig.



Green supply chain

- Green supply chain management
- International green products standards Compliance

Green Certification

- Certifications of Greenhouse gas inventory and carbon footprint.
- Certifications of low halogen product and non-hazardous substance

Green logistic

- Use eco packaging to maximize logistic efficiency.
- Configure efficient global logistic system to lower the use of fuels.

Holistic Approach to Greening IT

Holistic approach is used to handle environmental impact Of IT in six angles.

1.Green design-Design energy efficient ,environmental friendly ,computers & its components .

2.Green ManufacturingManufacturing electronic components less or no impact on environment.

3.Green Use-Reduce energy consumption of computers & components in environmental friendly manner.

Green disposal-Refurbish and reuse old computers & properly recycle unwanted computers & electronic equipment.

Green Standards & Metrics-These are to promote compare & benchmark sustainability initiatives, products, services & practices.

Green IT strategies & Policies-Effective strategies & policies add value & focus on short term & long term benefits. Policies are joined with business strategies & practices and are key components of greening IT

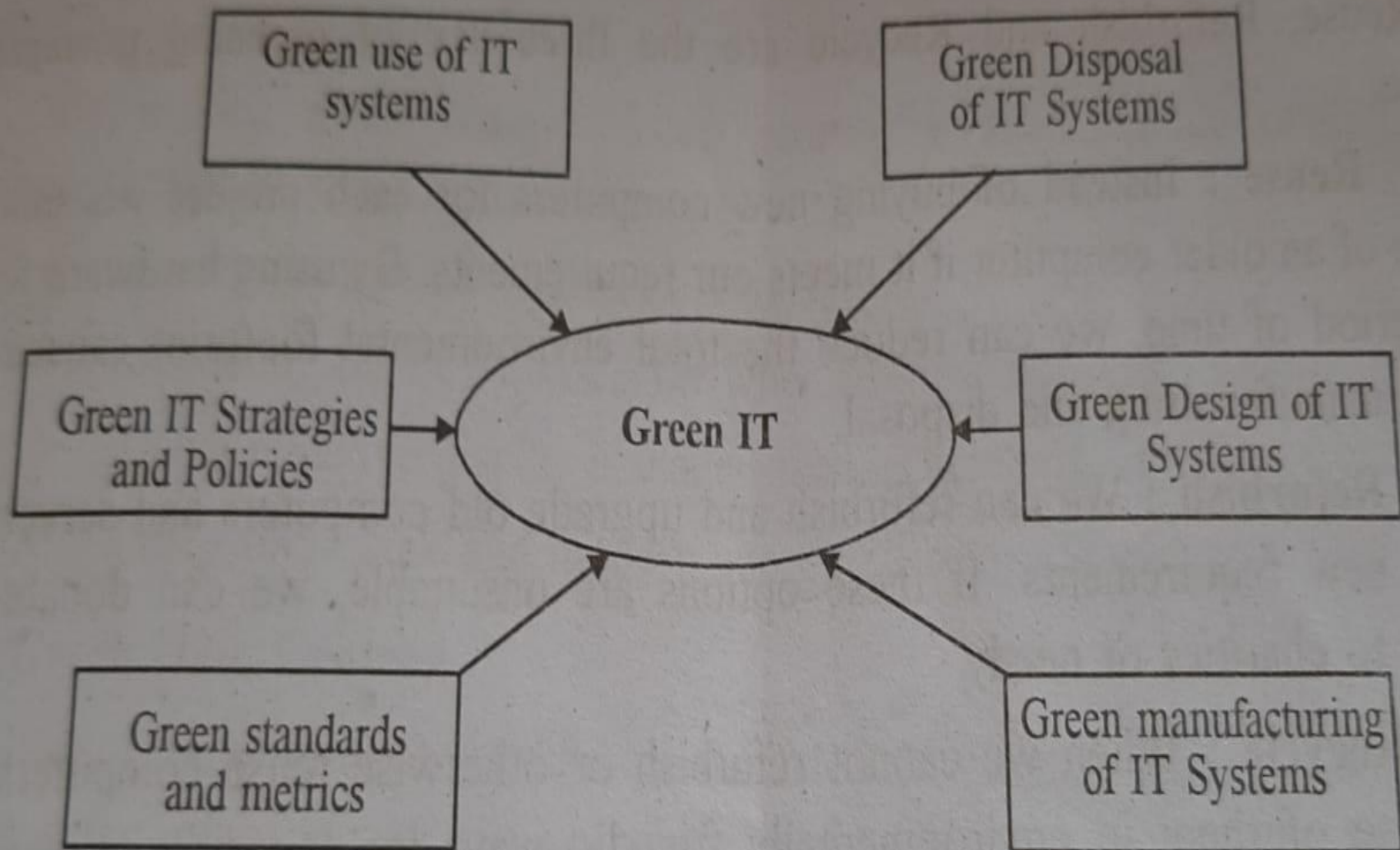


Fig. 1.8 Holistic, multipronged approach to greening IT

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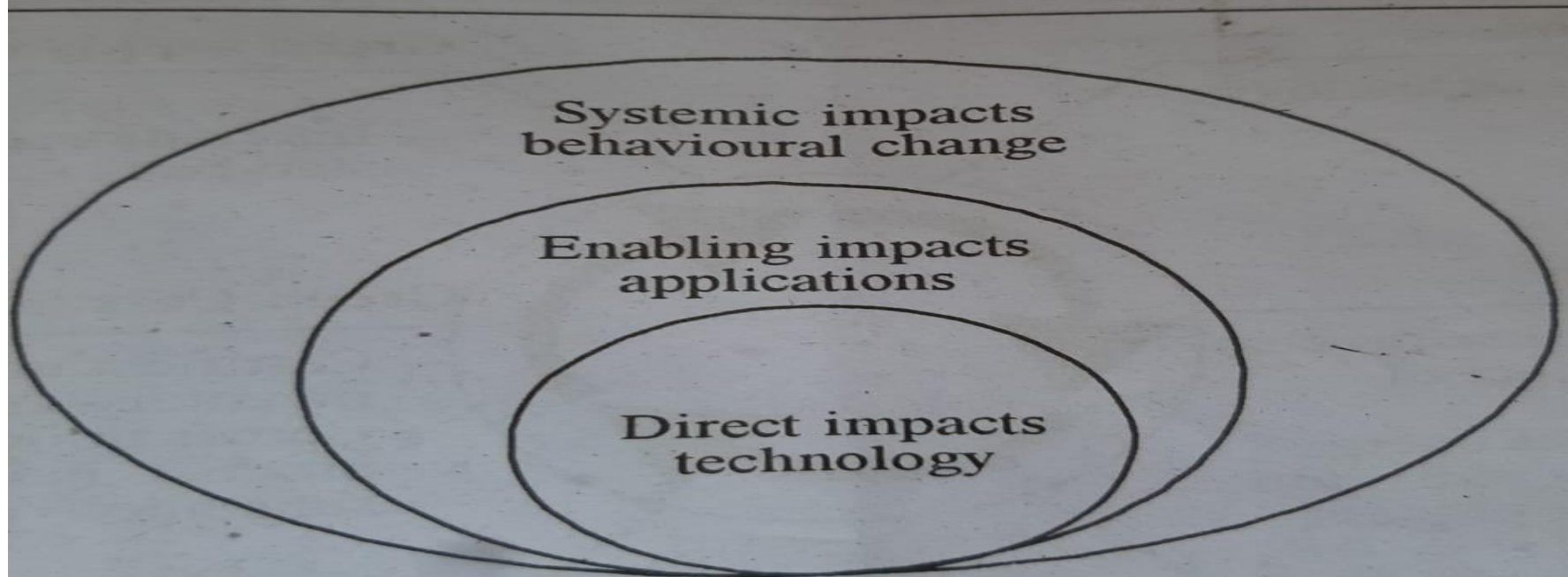
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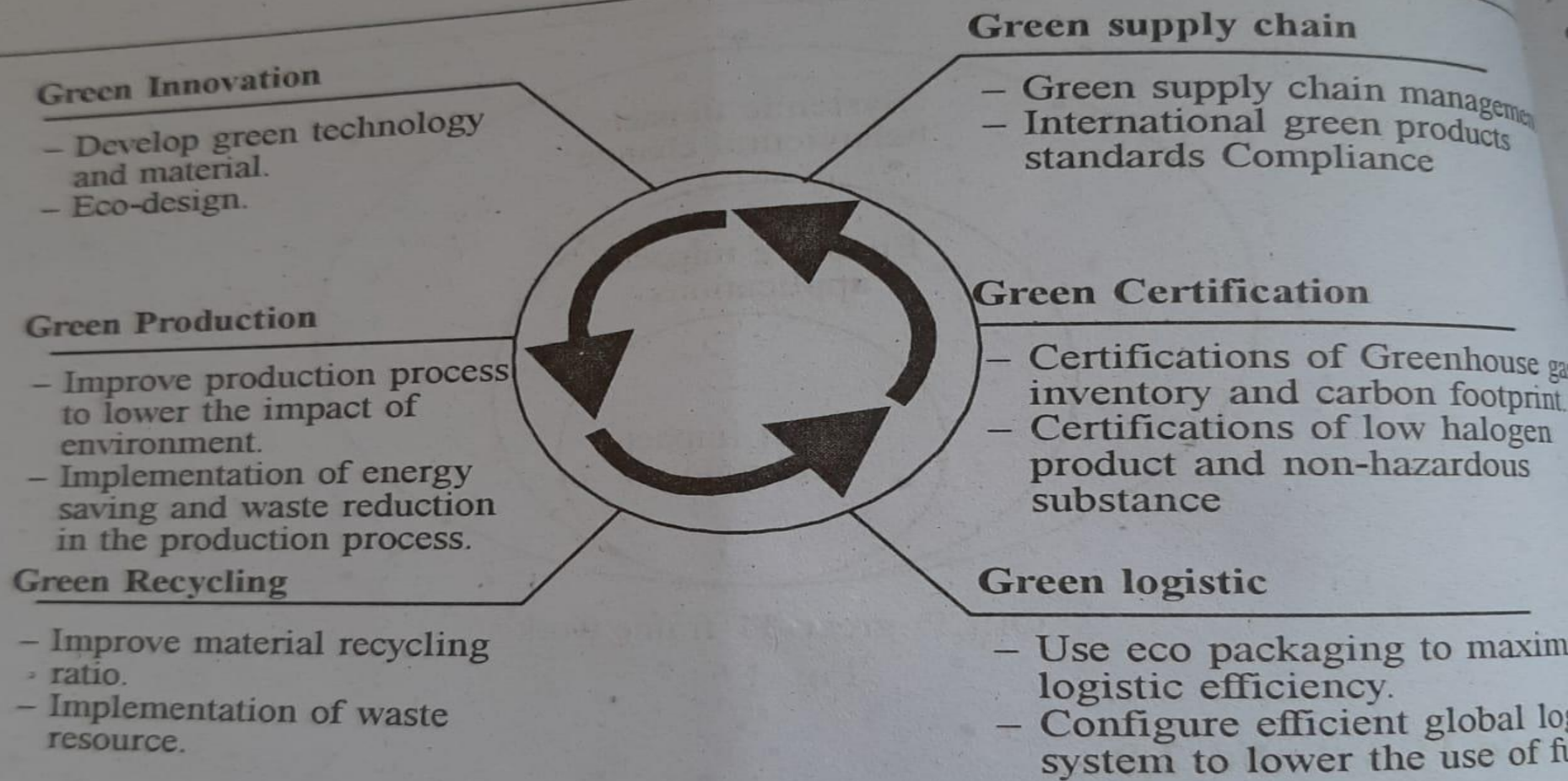


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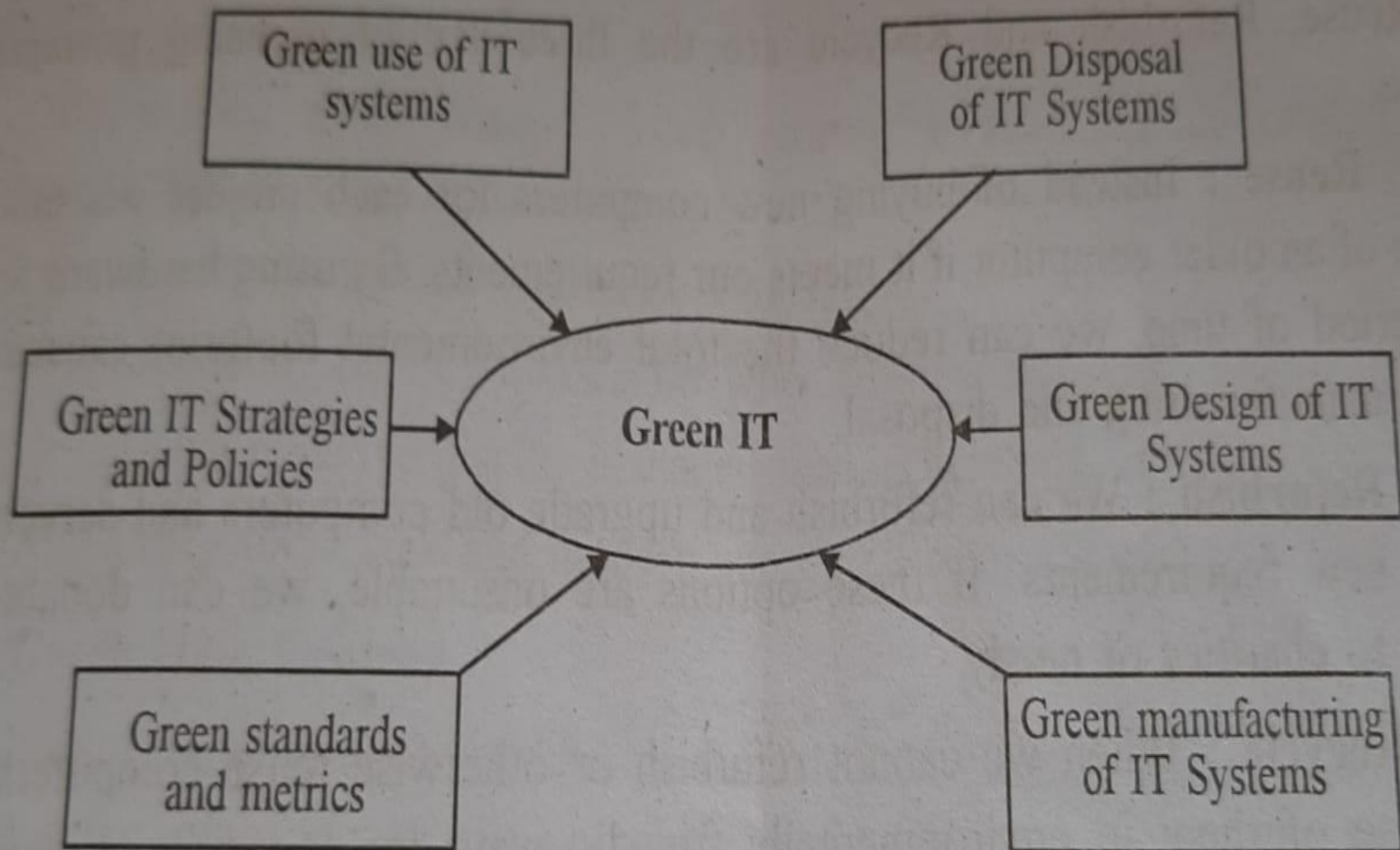


Fig. 1.8 Holistic, multipronged approach to greening IT

GREEN PC's & SERVERS

By making small change we can reduce **energy consumption of** PC's & servers.

- Power mgmt features
- Switching of PC's & servers when not in use.
- Use screensaver effectively.
- Use thin client & energy efficient computers.

Green Data centers

Data centers are backbone for internet & corporate computing.

Carbon footprint of datacenters is raising as they consume much energy.

With maximum energy efficiency, carbon footprint can be reduced. and it reduces impact on environment & is called Green data center.

Green Cloud Computing

Cloud computing is to deliver **computing services** over internet based on demand.

It's a transition from computing as a **product** to computing as a **service**.which is shared & scalable on demand.

GREEN DATA STORAGE

It is practice to use clean energy storage methods & products to cut down on a data center's carbon.

Methods to improve energy efficiency & to reduce overall cost of existing data such as

- A. MAID(massive array of Idle Disks)**
- B. Disk spin down**
- C. Tiered storage**
- D. Solid state drives(SSD's)**
- E. Storage Virtualization**
- F. Thin Provisioning**
- G. Data de-duplication**

Data de-duplication is removal of redundant data to improve storage utilization. It reduces required storage capacity as only unique data are stored.

GREEN SOFTWARE

Green s/w is environmental friendly s/w that helps to improve environment.

Green s/w is classified into 4 categories.

s/w ie greener consumes less energy.

Smart operation s/w assists in things going green.

Reporting Software-sustainability & carbon
mgmt s/w.(CMS)

S/w for understanding climate change, asses its
effect to form suitable policies.

Sustainable s/w is develop s/w to address
environmental issues.

Green Networking & Communication

Green networking refers to reduction of unnecessary energy consumption using energy efficient networking technologies.

Green networking practices include the following

- 1. Use modern ,more energy efficient techniques,technologies & products.**
- 2. Adapting & upgrading older equipment with new green technologies.**
- 3. Effective user & resource mgmt to increase energy efficiency.**
- 4. Reduce travel mode of communication by using telecommuting & vedio conferencing**

Applying IT For Enhancing Environmental Sustainability

Main source of GHG emissions is from Non IT sources.

By using IT in smart way environmental pollution can be reduced.

- **S/w tool**-analyze modeling,simulating environmental impacts for managing risks of environment.

- **Platforms**-for eco management,emmission trading& ethicla investing

- **Auditing & Reporting Tools**-for energy consumption & savings to monitor GHG emissions.
- **Knowledge Mgmt Systems**-to transfer environmental knowledge, decision support systems & collaborative environment. Environmental information Systems.
- **Interoperable Environmental Monitoring Networks.**

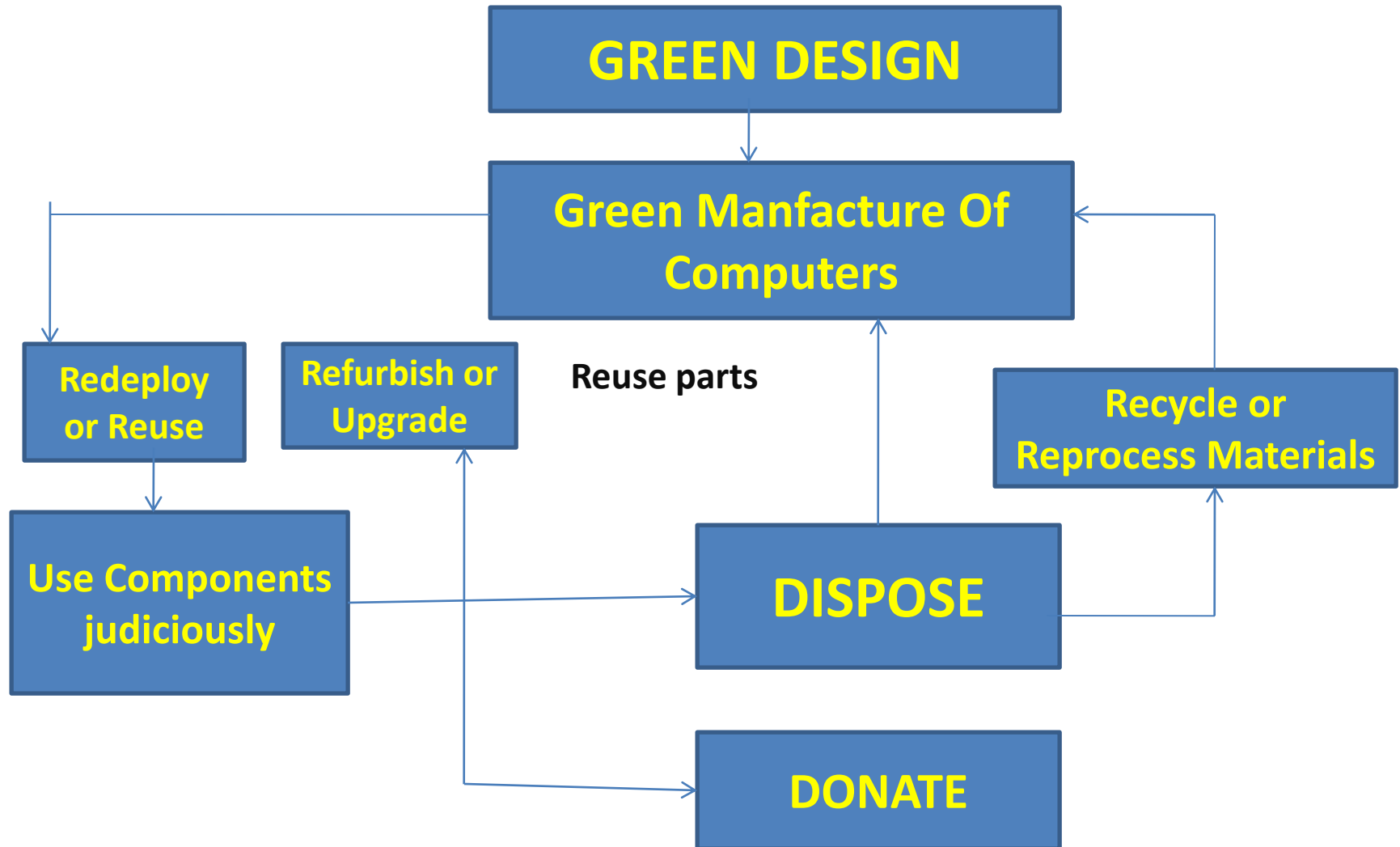
Greening Computer's Entire lifrCycle

The lifecycle of a computer system could be made greener,

**by reducing GHG emmissions & carbon footprint
&**

**Eliminating toxic materials released to
environment.**

Greening Computer's Entire Lifecycle



Three R's of Green IT

Unwanted computers or other hardware cause serious problem to environment.

So we should refurbish or reuse them, or dispose them in such a way that it create less impact on environment.

They are

Reuse Refurbish & Reycle are three R's of

3 R's Of Green IT

1.REUSE-We should use older computers rather than buying new computer for different projects.By using any hardware for longer duration reduces total footprint to environment caused due to computer manufacturing & disposal.

2.REFURBISH-We can upgrade old computers & servers to meet new needs,If we cannot upgrade,then can be donated to needy or charities.

RECYCLE-When we cannot refurbish or reuse then we have to dispose them in environmentally friendly manner.

le thru electronic recyclers or E waste collectors.

IT hardware consists of toxic materials like lead,chromium cadmium & mercury.

If waste not disposed properly it causes serious damage to environment & us

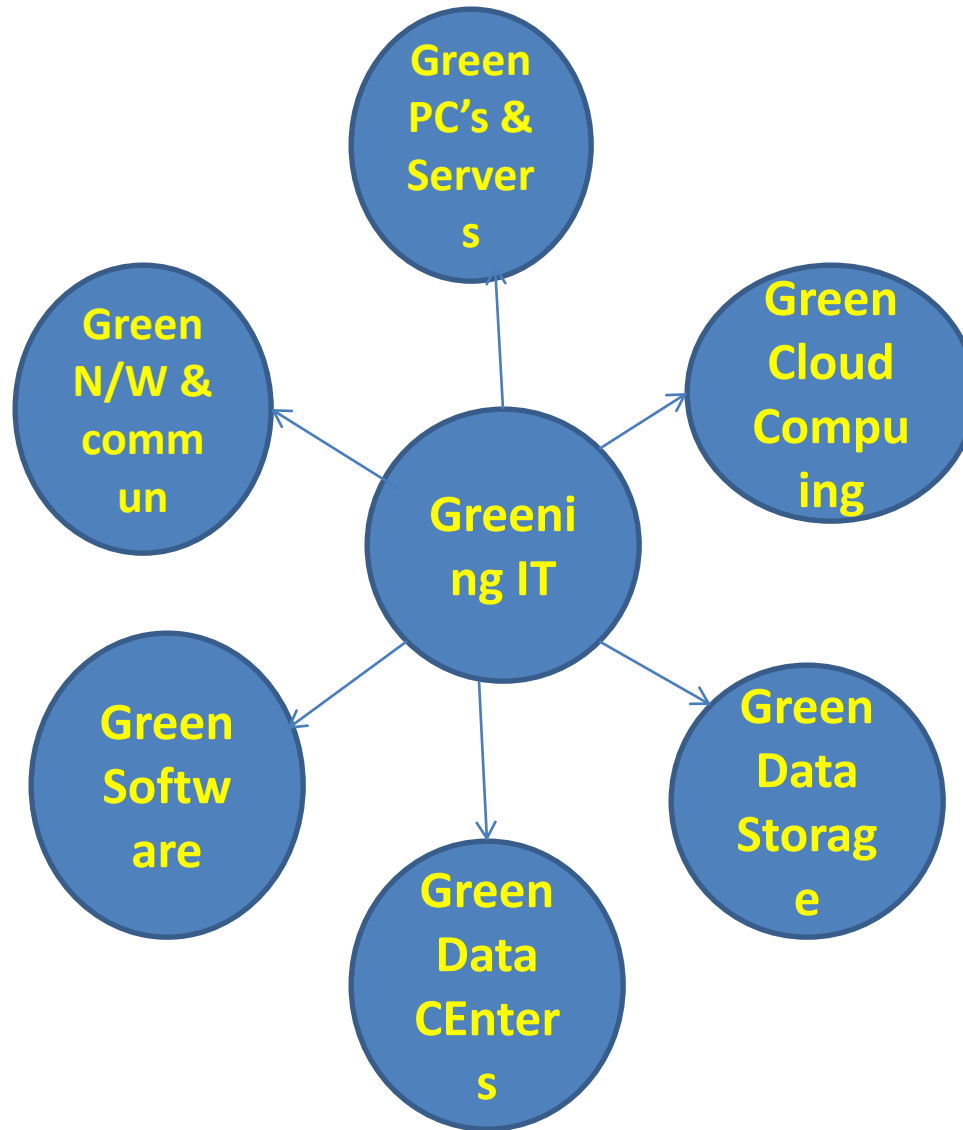
GREENING IT

Every IT can be greened.ie we can reduce energy consumption by computers its components by making small changes & use them.

Greening IT works on 6 mazor areas of IT field by reduving energy consumption by thwm.

6 areas are as follows

GREENING IT



GREEN IT STANDARDS & Eco-Labeling of IT

A number of green IT standards & directives are there.

Key among them are

EPEAT(Electronic Product Environmental Assessment Tool)

ROHS(Restriction of Hazardous Substances Directive)

WEEE(Waste Electrical & Electronic Equipment Directive)

Energy Star

LEED(Leadership in Energy & Environmental Design)

The **ISO 14001** are major standards for designing & implementing environmental mgmt system effectively.

EN16001 Energy Mgmt Systems

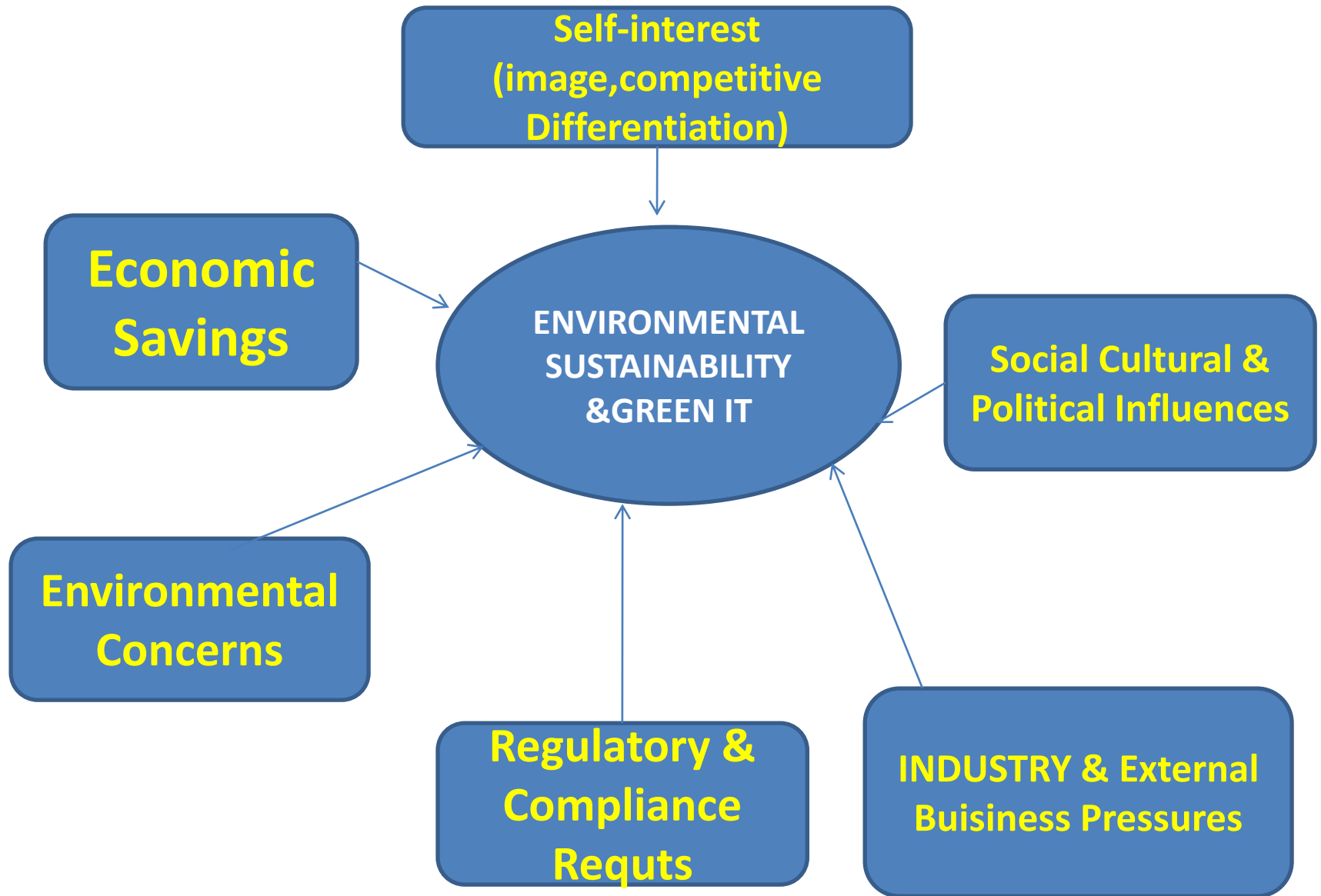
EPEAT is a free trusted source of environmental product rating .By this its easy to select high performance electronics that meet goals of IT organization & sustainability goals.

ENTERPRISE GREEN IT Strategy

There are major benefits when we apply & accept Green IT & initiatives..

So Govt & other companies are planning different strategies.

DRIVERS OF ENVIRONMENTAL SUSTAINABILITY & GREEN IT



There are 3 approaches used by enterprise to plan for Green IT,

They are

1.Tactical Incremental Approach-

Here,Enterprise use on hand IT infrastructure & Policies.

Use easy measures to achieve goals to reduce energy consumption.

Measures are:-

- **Accept Policies & Practices.**
- **Power Mgmt**
- **Turn off computers when not in use.**
- **Use energy efficient lightings**
- **Maintaining best room temperature**

2.Strategic Approach

- ❖ Here,IT inspects it's infrastructure & its use from greenpoint of view.
- ❖ Prepares a plan to handle main aspects of greening it's IT & uses new initiatives ,to reduce cost & carbon footprint.
- ❖ Branding.
Image creation.
- ❖ Marketing.

Deep Green Approach

In this approach, enterprises take extra measures to apply carbon offset policy to reduce GHG emissions.-it includes growing trees,trade carbon credits from carbon exchanges or using green power generated from solar or wind energy.

GREEN WASHING

Green washing is making false claims about practices that some organizations are implementing or procedures that organizations are applying to have their green certificates.

It's Green washing when a company or business spends more time and money to claim to be "green" thru advertising & marketing, that to use some business practices to reduce impact on environment..

General idea behind green washing is to create a benefit as a green company..

Many energy companies –ie some world's biggest carbon emitters have rebranded themselves as environmental friendly.

This socially careless & bad practice misleads customers about company's environmental practices..

It is a marketing trick to have eco friendly image to consumers

GREEN IT :Burden or Opportunity

The green IT philosophy & go green reduces IT's energy consumption & save on enegy bills.

Green philosophy also includes improving energy efficiemcy,resource utilization,reducing waste,promotimg reuse & recycling & more such benefits.

This turn IT green & use IT in new ways to green all corporate functions

Green IT Burden or Opportunity ?

IT has fundamentally altered our work and life and improved our productivity, economy, and social well-being.

An increased awareness of the harmful effects of greenhouse gas (GHG) emissions, new stringent environmental legislation, concerns about electronic waste disposal practices, and corporate image concerns are pushing businesses and individuals to Go Green.

Going forward, IT now has a new role to play—helping to create a greener, more sustainable environment while offering economic benefits.

Green IT is the study and practice of designing, manufacturing, and using computers, servers, monitors, printers, storage devices, and networking and communications systems efficiently and effectively with minimal impact on the environment.

However, there's a disparity in the level of green IT understanding across companies, professionals, students, and users. Many don't know how or where to begin or are unwilling to implement Green IT. Although green initiatives are catching the attention of the corporate world, some professionals, executives, and departments feel excessively burdened with the Green Philosophy. However, upon closer examination, they'll find that going green is a sound strategy.