



## Green Computing: An Observed Study

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**Abstract**— *Green computing refers to the practice and procedures of using the computing resources in an eco friendly way while maintaining the overall performance of the computer. Green computing is a balanced and sustainable approach towards achieving a healthier and safer environment green without compromising the technological needs of present and future generations. Today it is the major challenge to prepare such equipment by which we obtain energy efficiency and reduce electronic waste and the use of toxic chemicals / materials not in the preparation of e-equipment. With the help of Green Computing, we can reduce the consumption and disposal of electrical waste (e-waste) resources. The aim of this research paper is to check the level of awareness of Green computing in common man. A survey was conducted with the help of a questionnaire on green IT and survey results being shown.*

**Keywords** -*Green computing, Green IT, toxic material, E-waste, Energy stars.*

### I. INTRODUCTION

Green computing is the practice of using computing resources efficiently. The main objective green IT is an expanded spectrum of values and criteria for measuring organizational and societal success. "Green" in the information technology industry means increasing the use of IT resources while minimizing negative impacts on the environment.

This campaign started because of the undeniable state of the environment which does not only concern a part of the world, but the entire planet as well. The objectives are similar to green chemistry; reduce the use of hazardous materials, maximize energy efficiency during the lifetime of the product, and promote the recyclability of biodegradability of defunct products and factory waste. This initiative focuses on the study and practice of design, manufacture, use and disposal of computers and other devices that are actually subsystems associated with a significant impact or not 'environment. High performance and energy savings are conflicting objectives in green computing. The impacts of toxic waste that are produced by us throw our old computers and devices leads to land pollution. Computers have power hogs that generate pollution of the energy they consume for their process that are actually subsystems associated with a significant impact or not on the environment. [1]

Green computing is to reduce the carbon footprint generated by the business information systems while saving money. Green-Computing as defined in the Official Journal of the French Republic 12 July 2009, sets of information and communication for a short eco-ICT are information and communications technology whose design or use can reduce the negative effects of human activity on the environment. Green computing is very essential for the future world. It is necessary to make our self and our environment healthy. It can be defined as being responsible with the resources available. The main objective of this technology is to study and practice effective computing resources and the environment. Maximize energy efficiency and promote the biodegradability are the main objective of this technology. The goal of Green Computing is:

- To reduce the power consumption of the products.
- To reduce the harmful effects to the environments through the use of hazardous materials.
- To increase the life time of the product.
- To maximize energy efficiency during the product's lifetime.
- To promote recyclability of defunct products and factory waste.

### II. HISTORY OF GREEN COMPUTING

The term green IT was born with the Energy Star program was launched in 1992 by the U.S. Agency for Environmental Protection. Energy Star is a kind of label for computers and other .Energy Star program of electronic products by minimizing the use of energy while maximizing efficiency. One of the first approaches to green computing is sleep mode function in computers. Sleep mode function that puts a computer in sleep mode to a pre-determined period.

According to Wikipedia "The organization Swedish TCO Development launched the TCO Certification program to promote low magnetic and electrical emissions from cathode ray tube (CRT) computer display; this program was later expanded to include criteria on energy consumption, ergonomics and use of hazardous materials in the construction "[2].



Figure 1-Energy Star Logo

### III. CAUSES OF GREEN COMPUTING

#### 1) Electricity Consumption

All natural resources that are used to generate electricity have some other impact on Environment.

#### 2) Toxic Waste Creation

Most of us update our computer, lay the computer resources, peripherals and other devices, etc., that are obsolete, which are dangerous toxic waste we produce tonight really the environment now a days. Hazardous wastes are toxic by-products of manufacturing, agriculture, city sewage systems, construction, garages, laboratories, hospitals and other industries. The wastes can be liquids, solids; chemical sludge contains heavy metals, radiation, dangerous pathogens or other toxins. Even households produce hazardous waste from items such as batteries, computer equipment used, and the paintings of toxic pesticide residues or wastes often contain carcinogens, and exposure to them by a certain path, as leakage or evaporation of storage, causes cancer to appear with increasing frequency in exposed individuals. a certain path, as leaks or evaporation from the storage, causes cancer to appear with increased frequency in people exposed.

#### 3) Effect of Pollution to the Enviornment

Pollution prevention is a major global concern because of the harmful effects of pollution on a person's health and on the environment. Environmental pollution comes in various forms, such as: air pollution, water pollution, soil pollution, etc. Air pollution impacts on climate transform, acid rain, ozone, air toxics. Water pollution results on consumption of water resources and pollutes the water bodies and land pollution devalues the land and degrades the land which has harmful brunt on ecosystem and aesthetics. [3]

#### 4) Carbon Emissions

Carbon emissions, primarily carbon dioxide and carbon monoxide, are greenhouse gases that are produced by people. Greenhouse gases are gases in the atmosphere that trap and reflect heat and radiation back to the surface of the planet. It is believed that during the last century the amount of greenhouse gases in the atmosphere has increased due to carbon emissions and contributes to global warming. Carbon emissions are released into the atmosphere from things like cars, airplanes, power plants and factories. They also get released by people like you, when you use a vehicle or electricity created from burning fossil fuels. The computer you are using to read it to electricity, and so is your phone system and mobile gaming. [4]

### IV. BASIC STEPS TO ACHIEVE GREEN COMPUTING

#### 1) Develop a Sustainable Green Computing Plan

The elements that must be included in such a map should be discussed with your business leaders along with organizational policies and checklists. These plans should include policies for recycling, recommendations for the removal of the equipment used, the rule of the government and recommendations for the purchase of green IT tools. Green computing best practices and policies should wrap the power consumption, reducing paper consumption and offer new equipment and recycling old equipment. Organizational policies should consist of communication and implementation. [3]

#### 2) Conserve Energy

Turning off the system when not in use is the most basic energy conservation strategy for most systems. Many people believe the misconception that a computer's life is shortened by turning it on and off, so they leave their computers on all the time. The electronic equipment's life span depends on its cumulative operational time and its temperature. Turning it off reduces both of these factors, increasing the life of the equipment. [5]

#### 3) Reuse and Recycle

An old computer should continue to be used if it meets the user requirements. Otherwise, it can be given to someone who needs it or the functional components may be used from a retired product. When computers cannot be reused they must be disposed properly in environmentally friendly ways. Vast majority of unwanted computers and electronic goods end up in landfills. Electronic waste or e-waste—is one of the fastest-growing waste types, and the problem of e-waste is a global threat.. If computers are buried in landfills, harmful chemicals from them may leak into waterways and the environment. If burned, they release toxic gases into the air we breathe, so if e-waste is not discarded properly, it will be harmful to the environment and people. On the other hand, e-waste can be a valuable source for secondary raw materials. Old electronic systems should be recycled by taking component material and reprocessing it into the same material or breaking it down into constituent materials for reuse. [5]

#### 4) Eco friendly design

Eco-friendly data center designs use a synthetic white rubber roof, paint, and carpet that contain a low volatile organic compound (VOC), countertops made of recycled products, and energy-efficient mechanical and electrical systems at optimal efficiency. Eco-designs make use of both natural light as well as green power, which is basically electricity generated from solar or wind energy, to run the data center. Enterprises that adopt eco-friendly designs can get tax incentives and also gain a competitive advantage, because more and more customers want to work with eco-friendly firms.

#### 5) Reduce Paper Consumption

We have so many easy and understandable ways to decrease the consumption of papers: such as e-mails, electronic archiving, use the “track changes” feature in electronic documents. Whenever you take print out some documents, both sides of the papers should be used, smaller font sizes should be used, smaller margins are also helpful and only selective pages should be printed out. [3]

#### 6) Using screensavers

A blank screensaver conserves more power than a screensaver that displays moving images, which continually interacts with the CPU. But even that reduces the monitor’s energy consumption by only a small percentage. Using screensavers means that energy is not saved. If a person has a screen saver in his monitor for more than 5 minutes, then there is wasted energy. If a screen saver shows some moving images, this is consuming as much energy as when you are using it. [1]

### V. QUESTIONNAIRE ON GREEN COMPUTING

SNO	Questions	Yes	No	Don't Know	Comment
1	How many years have you been using a computer?				
2	How many hours per day do you usually use the computer?				
3	Do you switch your computer to low-power consumption mode everytime?				
4	Do you turn off your computer when it is not in use?				
5	Do you know constantly shutting down and restarting your computer during the day would consume more energy than just leaving it running?				
6	Do you care about environment?				
7	Do you know that the use of computing devices put harmful impacts on our environment?				
8	Do you know about term CO2 emission?				
9	Do you know about carbon emission (CO2) generated by computers and its devices?				
10	Are you doing some efforts to saving energy at home?				
11	Do you know about the term green computing?				
12	If you aware about green computing then what efforts are you doing to save environment				
13	Do you know that studying electronic documents is greener than printed documents?				
14	Do you know about the energy star program?				
15	When you purchase new electronic device do you consider energy star logo?				
16	Are you aware about the company's initiatives toward green computing?				
17	Do you know about disposing of computers and its devices?				
18	Have you ever disposed any computing devices?				
19	What would you do if your computer/laptop gets old?				
20	Have you ever seen or heard about any campaign about green computing?				

### VI. RESULTS OF SURVEY ON GREEN COMPUTING

Pie chart below shows the result on the survey of Green Computing. It shows about the percentage of the awareness of people about environment, Green computing, Power Consumption, Recycle and disposing of computer and its related devices and what efforts they are taken if they know about Green Computing. I have categorized the above questionnaire into 5 categories.

- Category1:** People care about power consumption
- Category2:** People care about environment
- Category3:** Awareness about green computing
- Category4:** Efforts taken by people towards green computing
- Category5:** Awareness about disposing/ recycling

### Survey Result

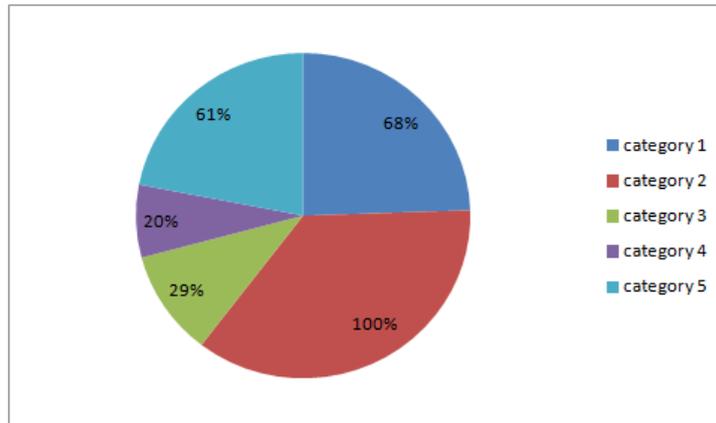


Figure 2: Pie Chart On The Basis Of Survey

The above Pie chart shows that according to the survey all people are care about environment but only 29% persons are aware about green computing and around 62% people are aware about formal recycling and decomposing. The 29% people take efforts toward green computing and about 68% people says that they care about power consumption. This survey shows that very less people know about Green Computing. So, it is very important to increase the awareness about Green Computing to all age Group.

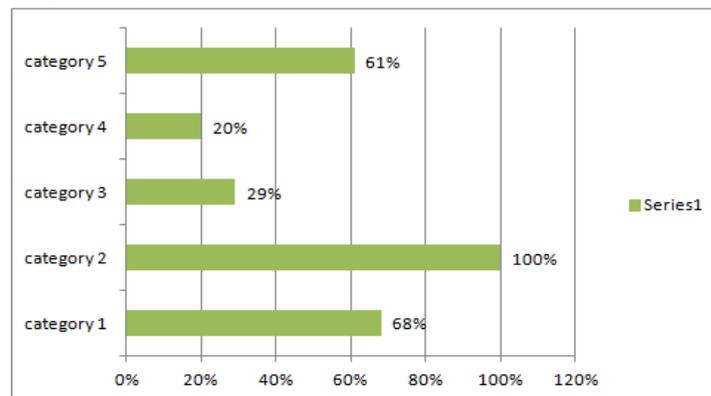


Figure 3: Bar Graph Representation On The Basis Of Survey

It is another representation of the survey. Here series1 denotes the questions used in survey in each categories.

### VII. CONCLUSION

This research paper shows a results of a survey which is done at all age group people shows that most of the people are not aware of green IT and those who aware about green computing takes no effort to use the idea of green IT in their day to day life. The main objective of this survey was to raise awareness about green IT and its impact on the environment and how people can use green IT in their daily lives.

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