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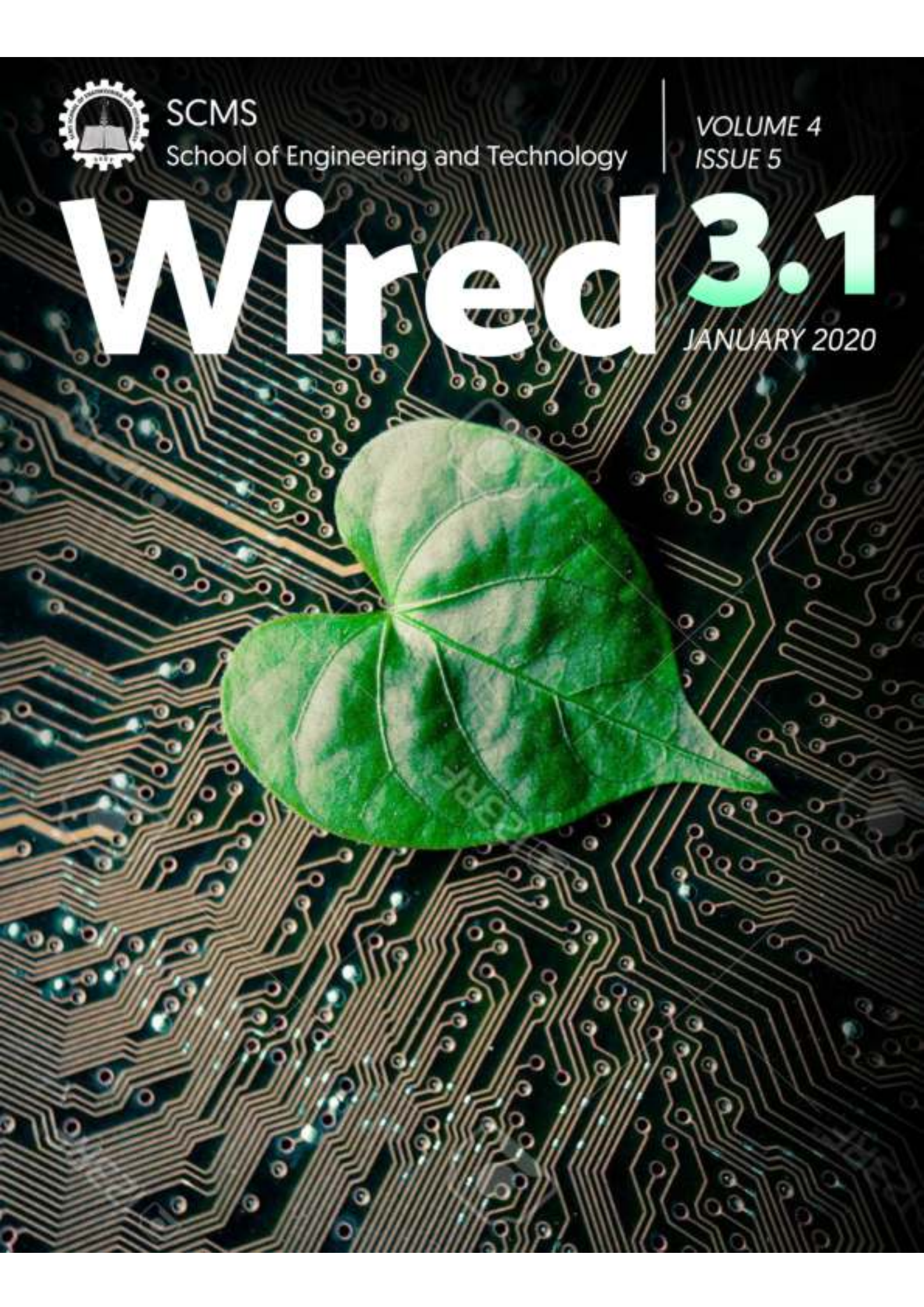

Sustainable computing is a rapidly expanding research area spanning the fields of computer science and engineering, electrical engineering as well as other engineering disciplines. The aim of Sustainable Computing is to publish the myriad research findings related to energy-aware and thermal-aware management of computing resource. It basically involves incorporating sustainable practices in computing field. The main aim is targeted towards preserving environment while dealing with computing resources.

Sustainable Computing is a set of principles that embraces a range of policies, procedures, programs, and attitudes that run the length and breadth of any use of information technologies. It is a holistic approach that stretches from power to waste to purchasing to education and is a life-cycle management approach to the deployment of IT across our organization. The concept of Sustainable Computing considers total cost of ownership, the total environmental impact, and the total benefit of technology systems.

Equally important is a spectrum of related research issues such as applications of computing that can have ecological and societal impacts. Sustainable computing publishes original and timely research papers and survey articles in current areas of power, energy, temperature, and environment related research areas of current importance to readers.

The ever increasing reliance on information technology has the potential to greatly increase our consumption of resources. With this in mind, we are committed to raising awareness about the impact of computing on the environment, providing tools to help the faculties, staff, students, and IT professionals be better environmental stewards of our computing resources and therefore ultimately changing the culture of the University to always consider the environment when making decisions about computing.

It helps the organization to move towards greener computing. Leaning towards such a capability will help us achieve significantly to reduce the amount of paper and toner used and the number of printers needed. Instead of a desktop printer for every individual, this technique encourages users and departments to consolidate their printing on to more cost efficient and less wasteful departmental printers and copies.

Below are the following ways in which you can preserve computing power-

The largest impact you can have individually is to turn off all equipment when you leave for the day – computers, monitors, copiers, printers, fax machines, etc.

Print in Economode when you can, this saves toner by printing lighter on paper.

Print duplex, this saves paper.

Change your default margins in MS Word, The current margin default settings of 1.25" left/right and 1" top/bottom "eat up" a lot of usable document space.

Review your document on the screen instead of printing a draft. If you must print a draft, use the blank back side of used sheets.

The best screen saver is no screen saver at all--turn off your monitor when you are not using it.

Buy EnergyStar appliances and equipment.

Turn off computers and appliances (like air conditioners, televisions, radios) when not in use. Unplug chargers when not in use.

TACKLING CLIMATE CHANGE WITH AI

By SANDEEP KURIAN JACOB

S2 CSE2

When we think of climate change , the paradigms that come to our mind are of the various industries and power plants, the last one that comes to our minds are tech companies and data centers, but surprisingly these tech companies are one of the major contributors to climate change. While they do not contribute much to climate change directly, their indirect effect can not be neglected. So, how do they contribute ? The data centers that run these companies are the major contributors to climate change. Google alone has 8 data centers all over the world with around 352,000 square feet of area per data center.

Now that's google’s alone, when we consider amazon and other major league players like microsoft and facebook the number skyrockets. These data centers consume huge amounts of energy and most of them come from conventional sources like coal and thermoelectric power plants which in turn contributes to climate change and CO2 emissions. To tackle this problem google, amazon, microsoft, apple and many other companies have started switching to more renewable sources of energy to power their data systems like wind farms and solar farms.

Although switching to renewable power sources have reduced their dependence on conventional power sources, the data center consumes vast quantities of energy every day, and its estimated to increase rapidly in the coming years as more and more data is being generated every hour. The major power consumer in data centers are the cooling systems which are used to maintain the temperature of the data center at around 27.7 degrees Celsius for optimum functioning of the data center. Maintaining such a large area at low temperatures consumes a lot of power. But like all machines, there's an optimum setting with which the energy consumption can be kept low. Usually in data centers these optimum configurations are manually calculated and implemented, which decreases the energy efficiency. With changing working conditions and environment temperature these systems can be optimised to reduce energy consumption by changing the configuration as per the working conditions, but when done manually these tasks become increasingly difficult and very hard to achieve practically.

Google in early 2019 implemented its deepmind AI system at its data center to control and optimize the cooling system to reduce energy consumption. The deepmind AI team monitored the cooling system at the data center every 5 minutes and fed it to the AI models. These models then chose actions aimed at reducing future energy consumption. These actions were then made into recommendations and given to a manual operator, which then implemented it in the system. With these AI recommendations, the data center consumed upto 40% less energy. The deepmind AI was then given direct control over the cooling system without human intervention, and the consumption went down by 30%. Now these were achieved in just a few days, the main advantage of AI is that it self improves over time and as it gains more and more data, it uses this data and develops more ways at increasing the energy efficiency. The deepmind AI can also be implemented in industries to attain more energy efficiency. Most of the high power machines used in industrial systems work on a preset line of commands, but these commands does not allow the machines to work at the best optimum condition for energy efficiency.

The machines used in industrial systems have a lot of configurations or combinations of settings that can be manipulated to attain maximum energy efficiency. But with hundreds of machines working there's just a lot of configurations that need to be manipulated to attain maximum efficiency and for a human worker, configuring all these machines isn't quite practical, especially as the work environment changes rapidly. Most of the industries thus end up using the most ideal combination of configurations throughout the work cycle. This wastes a lot of power. Using AI these configurations can be changed as and when required based on the work environment. The main benefit of using AI to optimise these systems is that the power consumption gradually decreases as the AI develops itself with the information inputs. As more and more tech companies strive towards reducing its carbon footprints using AI and machine learning, the total impact on climate change will decrease to a good extent. With the upcoming of powerful AI and machine learning algorithms we can surely expect a better future in terms of a reduced CO2 emissions and climate change.

There's no doubt that sustainable computing is on the rise. The University of Buffalo, part of the State University of New York system, has an aggressive program to cut overall energy consumption that is estimated to be saving more than $10 million annually according to the UB green program and some of those savings come from green computing.

UB figures that each computer uses $100 worth of electricity a year and that doesn't include the costs to power data centres and servers. There are additional costs associated with keeping server rooms and computer workspaces at the right temperature.

To counteract such energy demands, staffers are told to turn off computers when they're not needed and use power management software to put employees' monitors in sleep mode when not in use. For example, IT in the facilities department, which houses UB Green , keeps its several hundred computers on at night to accommodate occasional upgrades. Aside from power use, there are other green issues in IT.

Computer equipment contains a host of toxic materials, including lead and cadmium in circuit boards, lead oxide and barium in CRTs, mercury in switches and flat screens, and brominated flame retardants on printed circuit boards and cables. There has been a growing concern about the toxins in computer products giving rise to lead-free computers which are a greener alternative to the traditional computers used in corporate and office spaces.

If the companies can dispose off the lead free components, it’ll be easier because there are no potential toxins, then that's a benefit they can appreciate. But companies have been slow to adopt wholesale policies to foster green computing. That's because sustainable computing requires more than new products. It demands changes in IT policies and user behaviours, as well as cooperation across departments.

Here are some measures taken in different areas of the IT sector to help in being efficient and greener:

Industry

- Climate Savers Computing Initiative (CSCI) is an effort to reduce the electric power consumption of PCs in active and inactive states. The CSCI provides a catalogue of green products from its member organizations and information for reducing PC power consumption. It was started on 2007-06-12.
- The Green Electronics Council offers the Electronic Product Environmental Assessment Tool (EPEAT) to assist in the purchase of "greener" computing systems. The Council evaluates computing equipment and the products are rated Gold, Silver, or Bronze, depending on how many optional criteria they meet.
- The Green Grid is a global consortium dedicated to advancing energy efficiency in data centres' and business computing ecosystems. It was founded in February 2007 by several key companies in the industry – AMD, APC, Dell, HP, IBM, Intel, Microsoft, RackableSystems, SprayCool, Sun Microsystems and VMware.

Power management

The Advanced Configuration and Power Interface (ACPI), an open industry standard, allows an operating system to directly control the power-saving aspects of its underlying hardware. This allows a system to automatically turn off components such as monitors and hard drives after set periods of inactivity. In addition, a system may hibernate when most components (including the CPU and the system RAM) are turned off. ACPI is a successor to an earlier Intel-Microsoft standard called Advanced Power Management which allows a computer's BIOS to control power management functions.

Some programs allow the user to manually adjust the voltages supplied to the CPU, which reduces both the amount of heat produced and electricity consumed. This process is called undervolting. Some CPUs can automatically undervolt the processor, depending on the workload; this technology is called "SpeedStep" on Intel processors, "PowerNow!"/"Cool'n'Quiet" on AMD chips, LongHaul on VIA CPUs, and LongRun with Transmeta processors.

Video card

A fast GPU may be the largest power consumer in a computer.

Energy-efficient display options include:

- No video card - use a shared terminal, shared thin client, or desktop sharing software if display required.
- Use motherboard video output - typically low 3D performance and low power.
- Select a GPU based on low idle power, average wattage, or performance per watt.

Display

Light on dark colour scheme, also called dark mode, is a color scheme that requires less energy to display on new display technologies, such as OLED. This positively impacts battery life and energy consumption.

While an OLED will consume around 40% of the power of an LCD displaying an image that is primarily black, it can use more than three times as much power to display an image with a white background, such as a document or web site. This can lead to reduced battery life and energy usage, unless a light-on-dark colour scheme is used.

Materials recycling

Recycling computing equipment can keep harmful materials such as lead, mercury, and hexavalent chromium out of landfills and can also replace equipment that otherwise would need to be manufactured, saving further energy and emissions. Computer systems that have outlived their particular function can be re-purposed, or donated to various charities and non-profit organizations. However, many charities have recently imposed minimum system requirements for donated equipment. Additionally, parts from outdated systems may be salvaged and recycled through certain retail outlets and municipal or private recycling centres'. Computing supplies, such as printer cartridges, paper, and batteries may be recycled as well.

Cloud computing

Cloud computing addresses two major ICT challenges related to Green computing – energy usage and resource consumption. Virtualization, Dynamic provisioning environment, multi-tenancy, green data centre approaches are enabling cloud computing to lower carbon emissions and energy usage up to a great extent. Large enterprises and small businesses can reduce their direct energy consumption and carbon emissions by up to 30% and 90% respectively by moving certain on-premises applications into the cloud.

Edge Computing

New technologies such as Edge and Fog computing are a solution for reducing energy consumption. These technologies allow redistributing computation near the use thus reducing energy costs in the network. Furthermore, having smaller data centres', the energy used in operations such as refrigerating and maintenance gets largely reduced.

BY TOMIN JOSE | S8 CSE2

Approach to Make IT Sector an eco friendly industry

Since climate change is becoming a pressing issue its time that all industries across the globe take up an eco friendly approach to combat the adverse impacts of climate change. Global carbon emissions from information and communications technologies are comparable to those of the airline industry. The reason for this is that a massive amount of electricity is needed to operate computers, search engines and many others. Then there the pressure of consumer demand. People want the latest, the smartest and the fastest technology. The consumer demand is thus fast changing.

What is Green Computing?

Green computing also called as Green IT refers to the method by which computing is performed in a sustainable manner. The goals of green computing are : to reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, and promote the recyclability or biodegradability of defunct products and factory waste.

GOALS OF GREEN COMPUTING

- to reduce the use of hazardous materials
- maximize energy efficiency during the product's lifetime
- promote the recyclability or biodegradability .

Concept of Green Technology

Green technology is the field of science that involves the application of environmental science to offer economically viable solutions that conserve the environment and resources, and curb the negative impacts of human involvement. With the increase of data centers there has been an increase in the demand of energy and increased presence of toxic and hazardous substances .

Need of Sustainable Computing

Sustainable Computing is a field that applies techniques from computer science, such as information science, operations research and many others to help manage the balance between environmental, economic, and societal needs.The ultimate goal is to develop computational and mathematical models, methods, and tools for decision making and policy making concerning the management and allocation of resources for sustainable development which help us to reduce the massive amount of power consumption and maximum uses of eco-friendly computing .

Developing a Strategic Approach to a Green Future

With the challenges of climate change increasing day by day ,businesses and individuals urgently need to adopt precautionary principles and learn from best practices if they are to lend vision to the anticipated impact of green computing. The U.S. Environment Protection Agency (EPA) has highlighted the need to compare and select equipment based on environmental attributes using the Electronic Product Environmental Assessment Tool known as EPEAT. In this blog, employees on the ground share their expertise in saving energy and green computing. The EPA Green IT unit stresses the importance of "e-cycling".

Sustainable development is the need of the present time not only for the survival of mankind but also for its future protection. Unlike the other great revolutions in human history the Green Revolution and the Industrial Revolution, the ‘sustainable revolution’ will have to take place rapidly, consciously and on many different levels and in many different spheres, simultaneously.

On the technical level, for example, it will involve the sustainable technologies based upon the use of non-renewable fossil fuels for technologies that take advantage of renewable energies like the sun, wind and biomass, the adoption of conservation and recycling practices on a wider scale, and the transfer of cleaner and more energy efficient technologies to countries in the developing world.

On the political and economic levels, it will involve, among other things, the overhauling of development and trade practices which tend to destroy the environment, and the improvement of indigenous peoples, a fairer distribution of wealth and resources within and between nations, the charging of true cost for products which exploit or pollute the environment, and the encouragement of sustainable practices through fiscal and legal controls and incentives.

On the social plane, it will involve a renewed thrust towards universal primary education and health care, with particular emphasis on the education and social liberation of women. On the environmental level, we are talking about massive afforestation projects, renewed research into and assistance for organic farming practices and biopest control, and the vigorous protection of biodiversity. On the informational level, the need is for data that will allow the development of accurate social and environmental accountancy systems.

The aim of ecologically sustainable development is to maximize human well-being or quality of life without jeopardizing the life support system. The measures for sustainable development may be different in developed and developing countries according to their level of technological and economic development.

But developing countries, like India, can focus attention on the following measures:

1. Ensure clean and hygienic living and working conditions for the people.

2. Sponsor research on environmental issues pertaining to the region.

3. Ensure safety against known and proven industrial hazards.

4. Find economical methods for salvaging hazardous industrial wastes.

5. Encourage afforestation.

6. Find out substitutes for proven hazardous materials based on local resources and needs instead of blindly depending on advanced nations to find solutions.

7. Ensuring environmental education as a part of school and college curriculum.

8. Encourage use of non-conventional sources of energy, especially solar energy;

9. As far as possible, production of environment-friendly products should be encouraged.

10. Use of organic fertilizers and other bio techniques should be popularized.

11. Environmental management is the key for sustainable development, and it should include monitoring and accountability.

12. Need for socialization and also humanization of all environmental issues.

The prime need for sustainable development is the conservation of natural resources. For conservation, the development policy should follow the following norms:

(i) Make all attempts not to impair the natural regenerative capacity of renewable resources and simultaneously avoid excessive pollution hampering the bio spherical capacity of waste assimilation and life support system.

(ii) All technological changes and planning strategy processes, as far as physically possible, must attempt to switch from non-renewable to renewable resource uses.

(iii) Formulate a phase-out policy for the use of non-renewable resources in general.

Thus, for a worldwide sustainable growth, there is need for efficient and effective management of available resources. In this field, the production of "environment-friendly products" (EFP) is a positive step. With the industrialization and technological development, markets are flooded with products of daily consumption. They could however be a source of danger to health and damage to our environment. There is thus need to distinguish the more environmentally harmful consumer products from those which are less harmful, or have a more benign impact on the environment right from the stage of manufacture through packaging, distribution, use, disposal and reusability or recycling.

Throughout the world, emphasis is now being put on the production of EFP. In India, plans are afoot to market EFPs with combined efforts of Bureau of Indian Standards, Ministry of Environment and Forests and Central Pollution Control Board. Since 1990, a scheme of labelling ECOMARK has also been started. In its first phase, the items included in this are soaps, plastics, papers, cosmetics, colors, lubricating oil, pesticides, drugs and various edible items.

The objectives of the scheme are:

(i) to provide an incentive for manufactures and to reduce adverse environmental impact of their products,

(ii) to reward genuine initiatives by companies to reduce adverse environmental impact of their products,

(iii) to assist consumers to become responsible in their daily lives by providing them information to take account of environmental factors in their purchase decisions, (iv) to encourage citizens to purchase products which have less harmful environmental impact, and (v) to improve the quality of the environment and to encourage the sustainable management of resources.

Not only in consumer goods production but in the field of energy production also, environment-friendly techniques of power generation can be used. For example, in power production from coal, PFBC (Pressurised Fluidised Bed Combined Cycle) technique is useful in which coal is burnt efficiently and cleanly in combined cycle plants. To cope with increased demand of the basic requirement of life and the limited supply of the natural resources, along with consideration of environmental degradation and ecological balance, we need to emphasize on optimal management of land, water, minerals and other natural

resources. There is also need to utilize the native wisdom of those people, who live close to nature and earth, for eco-restoration along with development.

In order to apply the principle of sustainable management in reality, a highly complex way of looking at the problem is required, involving various disciplines. Sustainability is first and foremost a mental question. Without a grasp of the need or the will to change awareness, we will not succeed in realizing the principle of sustainability in agriculture. It is upon the decision-makers in politics to create the right framework and the pre-conditions for a sustainable development in agriculture. Global involvement, on the other hand, must not be left out of account. Sustainability reflects our understanding of necessity and responsibility on the question for whom, for what and how production can be guided into the future in a way that is efficient, environmentally sound and sparing on resources.

Global change is an ecological phenomenon, whereas globalization is concerned with economic change. A recent analysis of sustainable agriculture in the context of trade liberalization and globalization raises equally significant concern for a more informed decision-making process at local, regional and international levels, hence considering about the fact that we humans have been polluting our environment. It is our duty to bring back a pollution free environment and keep our environment safe and clean.

The term eco-conscious was first used in 1972 and is a broad term that means "*marked by or showing concern for the environment*." There are many different ways people can make changes to conserve their environment, and the term environmentally conscious is a fundamental belief system that inspires action.

The big question of why:

To protect humanity since pollution is one of the most hazardous factors affecting the environment leading to toxic substances in daily diet. Humans cannot survive without nature. Nature provides a successful food chain, habitat and ecosystem for a variety of species thus providing equilibrium to the ecosystem.

The optimal use of natural resources is tangible to provide economic stability. The pace and congestion of city life has pushed people to go on trips to the forest, which has resulted in a significant rise in tourism to forest areas. Medicines are vital for our survival and a vast number of medicines are produced from forests.

Steps to be Eco-Friendly:

1. **Increase your awareness**
   When one is ready to think about their actions, being aware of "what they do and why" is a great place to start in the case of environmental conservation. Hence increasing awareness is the first step in starting off this venture.

2. **Ditch the Paper Calendars**
   There are a lot of people who depend on post-it notes and paper to-do lists. Utilizing the calendar or a to-do list app on the phone, reduces the amount of paper usage.

3. **Practice conserving**
   Whether it is making a conscious effort to turn off a light in another room, using cloth napkins, or picking out energy efficient appliances, there are many different ways one can practice their new understanding and awareness of being eco-friendly.

4. **Carpool when you can**
   Most people think of carpooling as something that is reserved for people who need to get to work. While splitting carpooling duties between a few coworkers is environmentally friendly and also saves on gas costs, carpooling can be used for nights out with friends, business travel, getting kids to school, and so much more.

5. **Shop Local as Much as Possible**
   One great way to help others and to be environmentally friendly is to shop locally. Products that are shipped cost more money, time, and resources. If one buys locally, they are supporting the farmers who live in your community and encouraging others to do the same.

6. **Be Conscious with Water Usage**
   Not only are different parts of the world experiencing water crisis, but it also takes a lot of energy to get water from nearby water sources into a house. Some of the ways one can reduce water usage include; reducing the time spent in the shower or bath, making sure all of the pipes are working optimally without leaks, and setting up a rain barrel to collect rainwater for different things like watering the lawn.

7. **Recycle as Much as You Can**
   Many grocery stores have recycling centers that give you a small amount of money for recycling bottles. While most people don't do it for the money, it does accrue, and you can save it for something fun. Recycling is more than just collecting your cans

and bottles. When grocery shopping, one can encourage recycling by purchasing products that have been recycled.

8 **Plant trees**

Trees have been destroyed rapidly because of housing and city growth, but trees are vital for our survival. They help clean the air, give us oxygen, provide shelter to wildlife, provide us with food, and contribute to the prevention of soil erosion. More than that, planting trees around your house can help reduce energy consumption because they provide shade during warm weather and can cool your home down, so that you require less air conditioning.

9 **Help prevent littering**

Littering is a big problem in some places, and you can make a difference. Whether you make a pact to not litter, or you carry a bag with you to pick up trash you see along the way; you can make a difference.

10 **Ditch plastic as much as possible**

Whether you make a decision to use canvas bags for your groceries or you stop using sandwich baggies for your lunches, finding ways to reduce the use of harmful plastic is a great way to be environmentally conscious. Some companies even have small rewards like weekly raffles for people who bring their own bags.

11 **Help protect wildlife**

Animals are becoming extinct or endangered because of human behavior. Whether you want to actively help stand together to protect animal habitats or you want to donate to companies who do it, being an active participant in protecting wildlife is essential.

Whether we realize it or not, we can only live by consuming resources provided by this planet. Take energy for instance, we only get the energy by utilizing resources like oil and coal provided by the earth. This is not to mention basic needs like food and water.

Thursday, January 30, 2020 5:18 PM

THE BOT SPEAKS OUT...

By: Arya Anil Kumar
S2 CSE1

Hi I'm a bot..as u humans call me
When u gave me a form and a purpose..
I felt heavenly....
it was way better than those days When
I had to weep as a useless trash...
U made me what I am today ...
But do you ever acknowledge our
identity?
U always tend to say that
We robots replace humans
But please do understand
We r not replacements
But just an addition
To help you, to assist you
To simplify your tasks
We don't copy humans
But do things in our own ways
In our own style.....
No human can replace another
Then how can we robots do so?
How can we ever be,
beyond the human brains
that created us & transformed us
to what we are today...
Our existence itself
Is your priceless gift
We would turn into trash
In a world without humans
So please stop playing slaves
And be our masters....
Though we don't have hearts
We love & nurture nature...
Don't be so heartless when you
carry one within your ribs
Love us as you do
But do love nature & your Co humans
Coz in this world ,
we all need each other
It's sad that I had to throw
light on these facts
to you my very own creator...
But at least now let's join hands
For a better world tomorrow
Where we all coexist
And Happiness echoes all around
Thus signing off for now
Got to get serviced & recharged..
So until we meet again
Sway sway good byes