EAST WEST UNIVERSITY

Assignment - 01

Course Title: Green Computing

Course Code: CSE407

Section: 01

Group: 06

Submitted To:

Dr. Engr. Ahmed Wasif Reza
Associate Professor, Department of Computer Science and Engineering

Submitted By:

Name	ID

1. The global initiatives on Green IT, relevant programs and bodies, and country-specific legislation on Green IT.

The expanding discipline of green IT is focused on using technology in an environmentally conscious manner. It involves cutting down on electronic waste, reducing the carbon footprint of IT operations, and encouraging people to utilize renewable energy sources. Many worldwide initiatives, appropriate authorities and programs, and country-specific legislation have been established to address these issues.

Worldwide Projects:

The Sustainable Development Goals (SDGs) [1] of the United Nations offer nations and organizations a framework for their efforts to build a sustainable future. The Paris Agreement is a worldwide deal that aims to limit global warming to 2 degrees Celsius or less.[2] The Green Grid is a multinational alliance of businesses, governmental bodies, and nonprofit institutions that collaborates to advance energy-efficient IT practices and infrastructure.

Associated Organizations and Programs:

The U.S. Environmental Protection Agency (EPA) [3] runs the Energy Star program to promote energy-efficient goods and procedures. A worldwide database of environmentally friendly electronics is kept up by the Electronic Product Environmental Assessment Tool (EPEAT). The Global e-Sustainability Initiative (GeSI) supports environmentally friendly business methods in the ICT sector and collaborates with businesses and governments to create standards and recommendations for sustainable ICT.

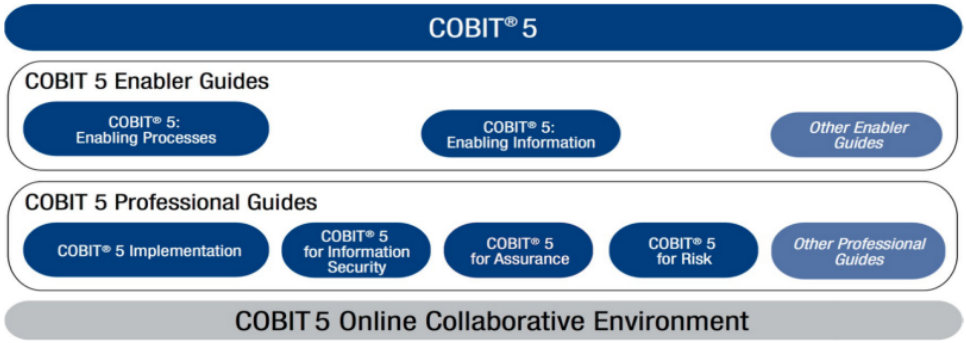
Regulatory Frameworks by Country:

Businesses are required under the Waste Electrical and Electronic Equipment (WEEE) Directive of the European Union Member States to collect and recycle electronic waste in accordance with this rule. Although the California Electronic Waste Recycling Act holds producers liable for the recycling and disposal of their electronic gadgets, the Chinese Energy Conservation Law encourages firms to utilize energy-saving techniques and reduce their energy use. These regulations promote the creation of new goods using recycled materials. [4]

There is a rising awareness of the environmental effect of IT and the necessity for ecologically responsible practices, as evidenced by agreements, programs and bodies, and country-specific regulations.

2. A Governance and Management Framework for Green IT.

Governance and management frameworks are essential for ensuring that organizations effectively manage their resources, including their information technology (IT) infrastructure. With the increasing focus on environmental sustainability, it is crucial for organizations to incorporate green IT practices into their governance and management frameworks.



Here are some key elements that could be included in a governance and management framework for green IT:

a. **Policy development:** Organizations should develop policies that outline their commitment to environmental sustainability [5] and specify the principles and practices that they will follow to achieve it. These policies should address issues such as energy efficiency, waste reduction, and responsible disposal of electronic waste.
b. **Leadership and culture:** Senior leadership should demonstrate a commitment to environmental sustainability [5] and encourage a culture of responsible resource management throughout the organization. This can be achieved through training, incentives, and clear communication of expectations.
c. **Metrics and reporting:** Organizations should develop metrics to measure the environmental impact of their IT infrastructure and track progress towards sustainability goals. Regular reporting can help identify areas for improvement and demonstrate the organization's commitment to environmental responsibility.
d. **Green procurement:** Organizations should consider the environmental impact of IT products and services when making purchasing decisions. This can include choosing energy-efficient equipment, selecting suppliers with strong environmental policies, and considering the entire lifecycle of a product, from manufacturing to disposal.
e. **Energy management:** Organizations should implement energy management practices that reduce the energy consumption of their IT infrastructure. This can include optimizing data center cooling systems, consolidating servers, and implementing power management policies on end-user devices.
f. **Waste reduction and responsible disposal:** Organizations should develop practices for reducing electronic waste and ensuring responsible disposal of IT equipment. This can include implementing a recycling program, donating or reselling equipment that is still functional, and using certified e-waste recyclers for equipment that cannot be reused.

By incorporating these elements into a governance and management framework for green IT, organizations can demonstrate their commitment to environmental sustainability and improve their overall resource management practices.

3. Governance for Green Growth in Bangladesh: Policies, Institutions, and Political Economy

With a population of more than 160 million, Bangladesh is a developing nation that is very vulnerable to the effects of climate change. Despite these obstacles, the nation has made notable strides in recent years toward achieving economic growth, poverty reduction, and social development. Bangladesh is now classified as a lower-middle-income country by the World Bank. But this development has come at a hefty environmental price, including water and air pollution, deforestation, and biodiversity loss.

The government of Bangladesh has implemented several institutions and policies [6] to support sustainable and green growth in order to address these environmental issues. These regulations include the National Sustainable Development Strategy (NSDS), the National Environment Policy (NEP), and the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) (NSDS). By promoting low-carbon, climate-resilient development, these policies seek to include environmental considerations in plans for economic and social development.

Institutionally, Bangladesh's major agency in charge of environmental management and policy is the Ministry of Environment, Forests, and Climate Change (MoEFCC). The Department of Environment (DoE), the Forest Department, and the Bangladesh Climate Change Trust Fund are just a few of the departments and organizations under the MoEFCC (BCCTF). These organizations oversee the creation and execution of policies and initiatives to solve environmental issues and support green growth.

Nonetheless, the political economy of Bangladesh has a significant impact on the effectiveness of these programs and institutions. The nation's political system is complicated, and there has been a long history of corruption, poor leadership, and lax enforcement of laws. These elements may reduce the efficiency of environmental organizations and policies as well as prevent private sector investment in green growth.

Bangladesh must keep bolstering its institutions and policies for green growth, as well as enhancing governance and combating corruption, to meet these difficulties. This can be accomplished through enhancing public participation in environmental decision-making, encouraging transparency and accountability in decision-making, and building the capacity of the institutions in charge of environmental management. Likewise, Bangladesh's attempts to promote sustainable and green growth can be assisted by international cooperation and partnerships.

4. Were there any Green Initiatives (e.g., 3Rs - reducing waste, reusing, and recycling resources and products) in Bangladesh? Which of those initiatives were related to Green IT? Which Green standards were followed?

To encourage sustainable growth and slow down environmental degradation, Bangladesh has established several green programs, including the 3Rs (reduce, reuse, and recycle). This is a discussion of some of the Green IT efforts and standards that have been adopted.

One notable initiative is the "Digital Bangladesh" campaign, launched by the government in 2009 with the goal of using information and communication technologies (ICT) to create a more sustainable and environmentally friendly society. This initiative has included the deployment of renewable energy systems, such as solar power, in rural areas to power ICT infrastructure, as well as the implementation of e-governance systems to reduce paper usage and increase efficiency.[7]

In addition, the Bangladesh Association of Software and Information Services (BASIS) has taken several steps to promote Green IT in the country's technology sector. For example, BASIS has developed a Green IT certification program to encourage companies to adopt environmentally friendly practices in their operations. The program covers areas such as energy efficiency, waste reduction, and responsible disposal of electronic waste.[8]

BASIS has also worked to raise awareness of Green IT among businesses and the public in Bangladesh. For instance, the organization has organized workshops and seminars on topics such as energy-efficient data centers, e-waste management, and sustainable software development.[9]

In terms of green standards, the Bangladesh government has adopted several international standards to guide its environmental policies and initiatives. These include the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement, and the Sustainable Development Goals (SDGs) of the United Nations.

5. Guideline and Code of Conduct for Energy Efficiency in Data Centers and Green Data Centers in Bangladesh.

The requirement to reduce negative effects on the environment, the economy, and the security of the energy supply led to the development of this Code of Conduct in response to the increased energy consumption in data centers. The goal is to inform and motivate those who own and operate data centers to minimize energy consumption in a way that is both practical and doesn't compromise the essential functions of data centers. The Code of Conduct works to increase understanding of energy use in the data center by promoting awareness, encouraging best practices, and setting objectives for energy saving. There are several talking points.

1. Build a thorough energy management system (EMS) to,
    a. monitor and control energy use in the data center.
    b. Improve airflow management and use energy-efficient cooling technologies to enhance cooling systems.
    c. Reduce power usage by using energy-efficient servers and storage equipment.

d. Consolidate servers and lower the number of physical servers in the data center using virtualization technologies. [12]
e. Use power management tools like dynamic voltage and frequency scaling (DVFS) to reduce power use when it's not needed.
f. Make use of energy-efficient equipment and lights throughout the data center.
g. Consistently track and assess data on energy usage to find potential areas for additional energy savings.[11]

2. Utilize renewable energy sources,

a. solar, wind, or hydropower, to power the data center.
b. Put in place a thorough waste management system to minimize, recycle, and reuse garbage the data center produces.
c. Promote the adoption of energy-efficient tools and equipment by data center users. Take action to conserve water in order to lower data center usage.
d. Put in place strategies to lessen the data center's carbon footprint, such as encouraging green transportation and video conferencing.[10]
e. Frequently report on energy usage, carbon emissions, and other sustainability indicators to show the data center's dedication to sustainability.

Data center operators in Bangladesh may cut down on energy use, cut down on carbon emissions, and support sustainable development by adhering to these rules and codes of conduct.

6. What role the academic/educational institutions (private and public) can play in Green IT regulation?

There are various ways that academic and educational institutions may contribute significantly to the promotion and application of green IT regulations:

a. Research: Academic institutions may study how IT systems affect the environment, pinpoint their biggest negative effects, and come up with mitigation plans. They can also investigate cutting-edge techniques and new technologies to strengthen the sustainability of IT systems.[13]
b. Education: Academic institutions can instruct students and working people on green IT principles, practices, and laws. To increase awareness and promote the adoption of sustainable IT practices, they can also provide courses and certifications in green IT. [14]
c. Accomplishment: Academic institutions may set a positive example by incorporating green IT practices into their own operations, such as employing renewable energy sources, cutting back on energy use, and decreasing e-waste.
d. Collaboration: To create and put into practice green IT solutions that are good for business and the environment, academic institutions can collaborate with commercial firms. Moreover, these alliances can promote the adoption of sustainable IT practices and aid with knowledge transfer.

To promote and put into effect green IT rules, academic and educational institutions must play a significant role. To advance environmentally friendly IT methods and technology, they can contribute to research, instruction, advocacy, implementation, and collaborations.

7. What role the industries (private and public) can play in Green IT regulation?

By doing the following, both public and private sectors may significantly contribute to the regulation of green IT:

a. **Consistency IT Practices:** Both private and public sectors may use sustainable IT strategies such as virtualization, cloud computing, and server consolidation. These actions support environmental sustainability by lowering energy use and carbon emissions.[15]
b. **Investing in Green Technologies:** Businesses may make investments in energy-saving technology including Energy Star-certified electronics, power management programs, and effective cooling systems. These innovations provide lower operational expenses, lower energy usage, and lower carbon emissions.[16]
c. **collaborating with the government:** Commercial and public sectors may work with governments to create and put into place legislation that supports green IT. This involves promoting laws and programs like tax breaks, grants, and subsidies that encourage the use of environmentally friendly IT methods and tools.
d. **Spreading Awareness:** Businesses may inform the public about the value of Green IT and the effects of IT on the climate. Education-related initiatives, training courses, and seminars can accomplish this.

Industries can create goals and track their progress toward reaching environmental sustainability objectives by setting targets and monitoring their performance. This involves monitoring and disclosing data on energy use, carbon emissions, and trash minimization.

Ultimately, strengthening Green IT legislation requires both the public and commercial sectors to play a significant role. Industries may contribute to building a more sustainable future for everyone by adopting sustainable IT practices, making investments in energy-efficient technology, working with the government, raising awareness, and defining goals.

References

1. Tolliver, Clarence, Alexander Ryota Keeley, and Shunsuke Managi. "Green bonds for the Paris agreement and sustainable development goals." Environmental Research Letters 14, no. 6 (2019): 064009.
2. Tolliver, C., Keeley, A.R. and Managi, S., 2019. Green bonds for the Paris agreement and sustainable development goals. Environmental Research Letters, 14(6), p.064009.
3. Epa, U. "United States environmental protection agency." Quality Assurance Guidance Document-Model Quality Assurance Project Plan for the PM Ambient Air 2 (2001): 12.
4. Işıldar, A., van Hullebusch, E.D., Lenz, M., Du Laing, G., Marra, A., Cesaro, A., Panda, S., Akcil, A., Kucuker, M.A. and Kuchta, K., 2019. Biotechnological strategies for the recovery of valuable and critical raw materials from waste electrical and electronic equipment (WEEE)–A review. Journal of hazardous materials, 362, pp.467-481.
5. Mandip, Gill. "Green HRM: People management commitment to environmental sustainability." Research Journal of Recent Sciences, ISSN 2277 (2012): 2502.
6. Khan, Bushra Ferdous. "Governance for green growth in Bangladesh: policies, institutions, and political economy." UKAid-Adam Smith International, Green Growth Knowledge Platform (2017).
7. Government of Bangladesh, "Digital Bangladesh." https://bcc.gov.bd/site/page/4d29778a-2144-4f88-bcf9-09c98a4f07aa/Digital-Bangladesh
8. Bangladesh Association of Software and Information Services, "Green IT Certification Program."
9. The hope of a sustainable green Bangladesh. https://www.thedailystar.net/star-youth/news/the-hope-sustainable-green-bangladesh-2908731
10. Uddin, Mueen, and Azizah Abdul Rahman. "Energy efficiency and low carbon enabler green IT framework for data centers considering green metrics." Renewable and Sustainable Energy Reviews 16, no. 6 (2012): 4078-4094.
11. Oró, Eduard, Victor Depoorter, Albert Garcia, and Jaume Salom. "Energy efficiency and renewable energy integration in data centres. Strategies and modelling review." Renewable and Sustainable Energy Reviews 42 (2015): 429-445.

12. Farahnakian, Fahimeh, Pasi Liljeberg, and Juha Plosila. "Energy-efficient virtual machines consolidation in cloud data centers using reinforcement learning." In 2014 22nd Euromicro International Conference on Parallel, Distributed, and Network-Based Processing, pp. 500-507. IEEE, 2014.
13. Silva, A. R. A., & Belfiore, P. (2022). The role of universities in promoting green IT: An analysis of the Brazilian case. Journal of Cleaner Production, 343, 130931.
14. Nascimento, G. M., Carvalho, A. F., & D'Avila, L. A. (2021). The role of universities in the transition to sustainable energy systems: Insights from Brazil. Journal of Cleaner Production, 315, 128150.
15. Pakzad, Parisa, and Paul Osmond. "Developing a sustainability indicator set for measuring green infrastructure performance." Procedia-social and behavioral sciences 216 (2016): 68-79.
16. AlKhidir, Tareq, and Suhaiza Zailani. "Going green in supply chain towards environmental sustainability." Global Journal of Environmental Research 3, no. 3 (2009): 246-251.