Assignment topic: Data Centers and Green IT Practices in Bangladesh

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Abstract

Data centers are crucial in supporting Bangladesh's growing digital economy, powering areas like e-governance, e-commerce, online education, and cloud services. However, these centers consume a lot of energy, especially for running and cooling, which creates environmental concerns. This study looks at how "Green IT" practices can help reduce the negative environmental impact of data centers in Bangladesh. By using energy-efficient technologies, adopting renewable energy sources, and improving cooling methods, data centers can reduce their operating costs and contribute to global efforts to cut down carbon emissions. This paper focuses on important green IT practices for data centers in Bangladesh and discusses the challenges of moving toward more sustainable operations.

INTRODUCTION

A data center is a dedicated facility used to house computer systems and related components, such as telecommunications and storage systems. Its primary function is to provide centralized data processing, storage, and access to information across networks. Data centers are crucial in today's digital economy, serving as the backbone for cloud services, online platforms, ecommerce, and large-scale data storage needs for organizations worldwide.

In Bangladesh, as the country experiences rapid digital transformation, data centers play an increasingly significant role. With the rise of e-governance, ecommerce platforms, digital banking, and the widespread use of cloud services, local data centers ensure low latency, data sovereignty, and compliance with national regulations. Local businesses, governments, and global enterprises operating in Bangladesh rely on data centers to process vast amounts of data securely and efficiently.
Data centers typically consist of various components such as servers, storage devices, power supplies, networking equipment, and physical security measures. These infrastructures require continuous operation to meet the growing demands of businesses and consumers. As such, they consume vast

amounts of energy to power equipment and maintain optimal environmental conditions, particularly cooling systems that prevent overheating. This immense energy consumption raises concerns about sustainability, and thus the concept of "green IT" has gained prominence.

1.1 Background

Bangladesh is witnessing a rapid digital transformation, with its economy increasingly dependent on the Internet, cloud services, and digital transactions. Data centers, which house large numbers of servers for processing, storing, and distributing data, are at the heart of this transition. As the demand for data storage and processing increases, so does the energy consumption of these data centers. Globally, data centers are responsible for a significant share of electricity consumption, with a large portion of this energy being used to keep the equipment cool.

Bangladesh's energy landscape is still largely dependent on nonrenewable resources such as fossil fuels, meaning that the energy used by data centers significantly contributes to the country's carbon emissions. As data centers expand, they require more electricity for uninterrupted power supplies (UPS), backup systems, and, most notably, cooling mechanisms to prevent server overheating. This increased energy demand is putting pressure on the country's already overburdened power infrastructure.

As the world moves towards greener and more sustainable technologies, Bangladesh, too, must consider how to make its data centers more environmentally sustainable. Green IT refers to the use of technology in a way that minimizes its environmental impact, focusing on energy efficiency, the use of renewable energy, and reducing electronic waste.

Implementing green IT in Bangladesh's data centers could play a pivotal role in reducing energy consumption, lowering greenhouse gas emissions, and promoting the use of renewable energy sources.

1.2 Research Objective

The primary objective of this research is to examine the current energy consumption patterns in data centers across Bangladesh and to explore how the adoption of green IT practices can reduce this consumption. Specifically, the study aims to:

- Investigate the energy efficiency of existing data centers.
- Identify the potential for renewable energy integration in data center operations.
- Explore the role of innovative cooling technologies in reducing energy use.
- Provide recommendations on how green IT can be implemented at a national scale to align with global sustainability standards.

This research will focus on large-scale data centers that are central to the digital infrastructure of Bangladesh, particularly those used by government bodies, financial institutions, and major corporations.

1.3 Research Questions

How can green IT practices be effectively implemented in data centers across Bangladesh to reduce energy consumption, lower operational costs, and minimize the environmental impact of these facilities?

1.4 Limitations of the study

Several limitations are present in this study. First, detailed energy consumption data specific to Bangladesh's data centers is limited. Much of the available data is from global sources, which may not reflect the local conditions or technological landscape in Bangladesh. This limits the

accuracy of projections related to energy efficiency improvements. Additionally, the study focuses on large, formal data centers, potentially excluding smaller data storage facilities or those that operate informally, which could also contribute to the overall energy footprint.

Another limitation is the availability of renewable energy infrastructure in Bangladesh. While the country has made strides in solar energy, it is still heavily reliant on fossil fuels, making the transition to green energy for data centers more challenging. Moreover, the recommendations provided in this study may not fully account for future technological advancements, which could offer more effective green IT solutions in the years to come. The rapidly evolving nature of both data center technologies and environmental policies means that this research may require updates as new developments occur.

Concept of Green IT

Green IT is becoming a central element in aligning business practices with environmental sustainability. It represents a shift where businesses can be both eco-friendly and profitable. As noted by Forrester Research, “Green IT is part of a fundamental change in the economy and society. It is a subset of the larger green (sustainable) business trend, which reconciles sustainable business practices with profitable business operations” (Forrester Research).

The focus of Green IT is on reducing energy consumption, especially in data centers which have seen significant increases in power usage. For instance, server power use doubled between 2000 and 2005 and was projected to rise another 40% by 2010 (Analytics Press). Green IT strategies aim to cut power usage, enhance energy efficiency, consolidate hardware, and optimize data storage (Brocade Communications Systems).

Green IT encompasses the entire lifecycle of ICT products—design, production, operation, and disposal. This involves principles like pollution

prevention, product stewardship, and the use of clean technologies (Harvard Business Review).

The approach includes four key phases: design, production, operation, and disposal, each focused on reducing environmental impact (Pacific Asia Conference on Information Systems).

A comprehensive view of Green IT integrates technical, human, and managerial aspects, applying environmental sustainability across all stages of IT infrastructure—covering design, production, sourcing, use, and disposal (RMIT University).

Practices include equipment recycling, server consolidation, virtualization, optimizing data center energy efficiency, print optimization, and airflow management. Emerging methods such as airside/waterside economizers and carbon offsetting are also gaining traction (Info~Tech Research Group).

Additionally, managing e-waste is crucial. Proper disposal and recycling of ICT equipment are essential to reducing environmental harm. Policymakers are increasingly addressing both energy efficiency and e-waste management to support a greener IT infrastructure.

In summary, Green IT provides a robust framework for businesses to improve efficiency while contributing to sustainability, focusing on reducing energy use, managing the lifecycle of products, and handling e-waste responsibly.

Importance of Green IT in Data Centers:

Green IT refers to the practice of designing, implementing, and managing data centers in an environmentally sustainable manner. It involves reducing energy consumption, minimizing waste, optimizing resource use, and adopting renewable energy sources. The focus is on ensuring that the environmental impact of data centers is minimized while still meeting the needs of the digital economy.

One of the main reasons green IT is essential in data centers is their environmental footprint. A typical data center consumes energy equivalent to thousands of homes, with a significant portion dedicated to cooling infrastructure. As the number of data centers grows worldwide, their collective carbon footprint has become a pressing global issue.

In Bangladesh, where energy demand is rising alongside digital transformation, integrating green IT practices in data centers can have a profound impact. Green IT helps reduce carbon emissions, lower operational costs, and contribute to the country's sustainability goals. Moreover, adopting energyefficient technologies and renewable energy sources like solar and wind power can help offset Bangladesh's reliance on fossil fuels for electricity generation.

Several key practices have emerged to promote sustainability in data centers:

1. **Energy-efficient hardware:** Using energy-efficient servers and storage devices that require less power to operate reduces overall consumption. Modern processors, for instance, are designed to perform high computing tasks using less energy.
2. **Optimizing cooling systems:** Implementing advanced cooling solutions, such as free cooling (using outside air), liquid cooling, and airflow management, can significantly reduce the energy used for air conditioning.
3. **Virtualization and cloud computing:** Virtualizing servers allows multiple applications to run on a single machine, thereby reducing the need for physical servers and the associated power and cooling costs. Cloud computing also reduces the environmental impact by enabling efficient resource allocation across shared infrastructures.

4. **Renewable energy:** Transitioning to renewable energy sources like solar panels or wind turbines to power data centers can drastically cut carbon emissions. For example, some data centers integrate hybrid energy solutions, combining grid electricity with renewable sources to reduce dependency on non-renewable energy.

5. **Waste management and recycling:** Ensuring proper disposal of old or inefficient equipment through recycling programs prevents hazardous materials from polluting the environment.

In Bangladesh, steps toward sustainable data center operations are emerging, driven by initiatives from both private and government sectors. Companies are adopting energy-efficient technologies, and some are exploring options for solar-powered data centers. However, there is still significant potential for growth in the implementation of green IT practices across the country.

Green IT practice in Bangladesh

In Bangladesh, the rapid growth of the digital economy has led to an increasing reliance on information and communication technology (ICT) infrastructure, including data centers, telecommunication networks, and cloud services. As a result, energy consumption and environmental concerns associated with ICT have become a pressing issue. The concept of Green IT, which emphasizes the sustainable use of technology to minimize environmental impact, is gaining attention in Bangladesh, particularly as the country faces challenges related to energy shortages, environmental degradation, and climate change.

Current Status of Green IT in Bangladesh

While Green IT is still in its nascent stages in Bangladesh, there are several ongoing efforts by both the public and private sectors to promote sustainable ICT practices. The country's growing digital infrastructure, including data centers and telecommunications, consumes significant amounts of electricity. With a heavy reliance on fossil fuels, this energy consumption has a substantial carbon footprint.

However, there is growing recognition of the importance of energy efficiency and sustainability in ICT. Some larger organizations and multinational companies operating in Bangladesh have begun to adopt Green IT practices,

including the use of energy-efficient servers, virtualization technologies, and eco-friendly cooling systems in data centers. For example, certain telecom operators have started using renewable energy sources, such as solar panels, to power remote cell towers, thereby reducing reliance on the grid and diesel generators.

Key Green IT Practices in Bangladesh

1. **Energy-Efficient Data Centers**: ○ Bangladesh's data centers are increasingly adopting energyefficient hardware, such as low-power servers and optimized storage solutions, to reduce energy consumption. This helps mitigate the environmental impact while also reducing operational costs.
    - ○ Advanced cooling technologies, such as liquid cooling and airflow management, are being implemented to improve energy efficiency in data centers. Some companies are experimenting with hot and cold aisle layouts to optimize cooling.
2. **Virtualization and Cloud Computing**:
    - ○ Virtualization technologies are gaining traction in Bangladesh, allowing organizations to consolidate multiple servers into fewer physical machines. This reduces energy consumption, cooling requirements, and hardware usage.
    - ○ The shift towards cloud computing is also helping companies optimize their IT infrastructure, reducing the need for physical data centers and enabling more efficient use of resources.
3. **Use of Renewable Energy**:
    - ○ Renewable energy is becoming a critical component of Green IT practices in Bangladesh. Solar power, in particular, is being utilized in rural and remote areas to power ICT infrastructure, including telecom towers and off-grid data centers. Some companies have started investing in hybrid energy solutions that combine solar power with traditional grid energy to minimize their carbon footprint.

4. **E-Waste Management**:
    - As ICT usage grows, so does the amount of electronic waste (ewaste). While Bangladesh faces significant challenges in managing e-waste, some organizations have initiated recycling programs to dispose of old IT equipment in an environmentally friendly way. These programs help reduce the environmental damage caused by improper disposal of e-waste, which can lead to soil and water contamination.
5. **Government Initiatives**:
    - The Government of Bangladesh has acknowledged the importance of sustainable ICT practices and is working on policies that encourage energy efficiency and the use of renewable energy in the ICT sector. The National ICT Policy includes provisions for promoting Green IT, with a focus on reducing the carbon footprint of the country's growing digital infrastructure.
    - Furthermore, the Bangladesh government has launched the Digital Bangladesh initiative, which, while focusing on digitization, also promotes sustainable development through ICT.

Challenges and Opportunities

Despite the progress, there are several challenges to implementing Green IT practices in Bangladesh. One of the primary challenges is the lack of awareness and expertise in Green IT technologies among local companies. Many businesses continue to rely on outdated equipment that consumes excessive energy. Additionally, the cost of upgrading to energy-efficient systems and adopting renewable energy sources can be prohibitive for small and mediumsized enterprises (SMEs).

Another challenge is the limited availability of infrastructure for e-waste recycling and disposal. Without proper facilities, much of the e-waste generated by the ICT sector ends up in landfills, posing serious environmental risks.

However, there are also significant opportunities for Bangladesh to adopt Green IT practices on a larger scale. As the global demand for sustainable technologies increases, international organizations and investors are showing interest in funding green projects in Bangladesh. Additionally, the country's abundant sunlight makes it an ideal candidate for solar energy adoption, which can power ICT infrastructure in both urban and rural areas.

2. Overview of Data Center Infrastructure

Bangladesh's data center infrastructure has been evolving rapidly due to the country's increasing reliance on digital technologies and services. As the digital economy grows, so does the demand for robust and scalable data center facilities to support various applications, including e-commerce, cloud computing, and government services.

1. Infrastructure Development:

- **Growing Sector**: The data center sector in Bangladesh is experiencing significant growth. Historically, the market was dominated by a few large players, but there has been a marked increase in the number of data centers and colocation facilities in recent years. This expansion is driven by the rising need for data storage, processing, and cloud services.
- **Modern Facilities**: Many new data centers in Bangladesh are being designed with modern infrastructure to meet international standards. This includes the adoption of advanced cooling systems, high-density power configurations, and improved physical security measures.
- **Energy Challenges**: Despite advancements, many data centers still rely heavily on traditional energy sources. The intermittent power supply and high energy costs remain significant challenges. However, there is a growing trend towards incorporating

renewable energy solutions, such as solar power, to mitigate these issues.

2. Connectivity and Bandwidth:

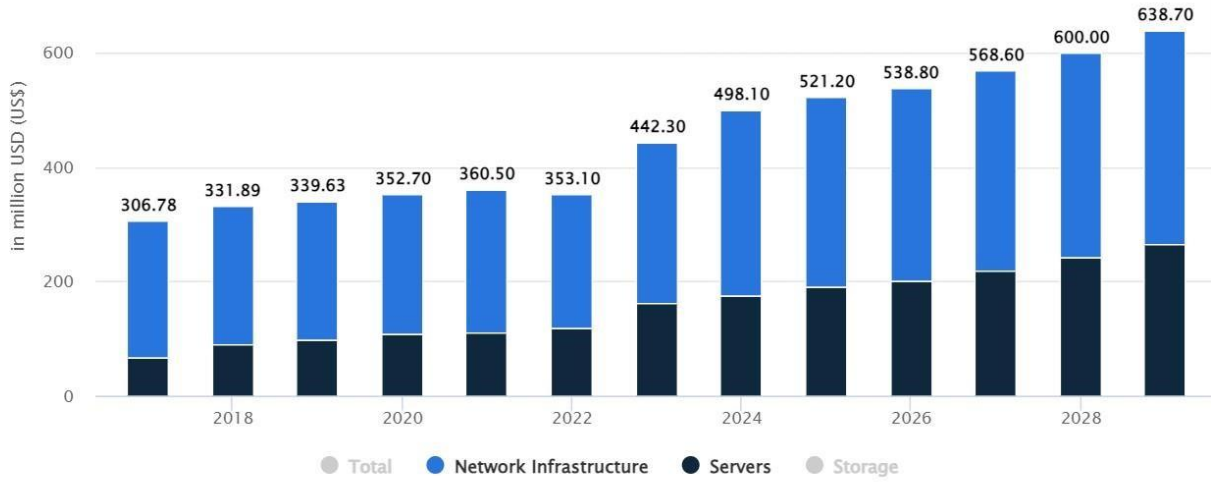
- **Network Infrastructure**: Bangladesh's data centers benefit from improving network connectivity and bandwidth. The country has been investing in enhancing its fiber-optic network and international submarine cables, which helps in providing faster and more reliable internet services.
- **Data Sovereignty**: With increasing concerns about data privacy and sovereignty, there is a growing demand for local data centers to handle sensitive information domestically. This trend is pushing organizations to invest in data centers within Bangladesh rather than relying on offshore facilities.

The Data Center market is a critical segment of the technology industry focusing on supplying and managing physical infrastructure necessary for hosting and operating IT systems, primarily servers, storage, and network equipment. The data center landscape in Bangladesh is evolving rapidly, driven by increasing demand for digital infrastructure. Here are some key highlights:

- **Meghna Cloud**: Meghna Cloud, Bangladesh's first cloud data center, was established by Gennext Technologies in February 2024 and is located at Bangabandhu Hi-Tech City, Kaliakoir, Gazipur.
- **National Data Centre**: The 200,000 square-foot Tier IV data center at Bangabandhu Hi-Tech City was built in 2019 and has eight 2.5 MW generators for use by the public and commercial sectors.
- **Private Investments**: There has been a significant surge in private investments in data centers. Like Meghna, Yotta Infrastructure and Gennext Technologies have made substantial investments in brand-new data center buildings
- **Strategic Location**: Dhaka, the capital and economic hub of Bangladesh, is home to the majority of the country's data centers.

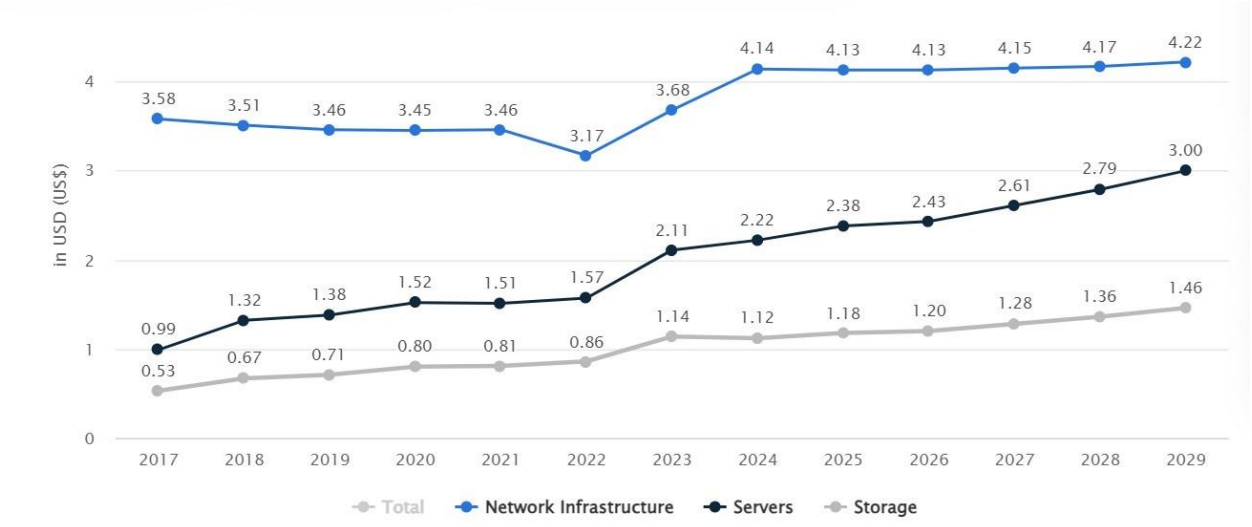
- **Future growth:** The Data Center market is expected to generate $585.90m in revenue by 2024, with network infrastructure dominating the market, with the US contributing the most revenue.

Revenue:



Notes: Data was converted from local currencies using average exchange rates of the respective year.

Average Spend per Employee



Notes: Data was converted from local currencies using average exchange rates of the respective year.

Key Players in the Data Center Market

18 organizations operate 19 data centres in Bangladesh. With two facilities, AFTAB Nagar Online Service (ANOS) is the most prevalent, followed by Zipnet, Future Net Solution, and i Smart. Bangladeshi cities Chittagong, Comilla, and Dhaka are home to data centre infrastructures.

1. Local Companies:

- **BTCL (Bangladesh Telecommunications Company Limited)**: BTCL operates some of the country's largest data centers. As a state-owned enterprise, it provides a range of services including colocation, managed hosting, and disaster recovery solutions.
- **Bdjobs.com**: Known primarily as a job portal, Bdjobs.com also operates data centers that support its extensive online services and job-matching systems.
- **Sangram IT Solutions**: This local IT services provider offers data center solutions, including managed services, cloud computing, and data storage. It caters to a range of industries from finance to education.
- **Meghna Cloud**: Bangladesh's first launched cloud data center which provides cloud infrastructure to various entities.
- **Gennext Technologies**: One major investor in the new Data Centre helps to meet the increasing demand for digital infrastructure.
- **Felicity IDC**: A local data center operator in Dhaka offering hosting services
- **Red.Digital**:Another local participant who operates the capital in the colocation market

2. International Players:

- **Google**: Google's cloud services are available in Bangladesh, although the company does not have a physical data center. Instead, it provides services through regional data centers located in neighboring countries.

- **Amazon Web Services (AWS)**: AWS provides cloud services in Bangladesh through its regional data centers. While AWS does not operate a local data center, its presence supports local businesses with scalable cloud infrastructure.
- **Microsoft Azure**: Microsoft Azure offers cloud computing services to Bangladeshi businesses through its regional data centers. Azure's presence helps local companies leverage advanced cloud technologies and solutions.
- **Yotta Infrastructure**: An international business is making significant investments in Bangladesh to build new data center facilities.
- **Zenlayer**: operates several data centers in Dhaka and offers colocation and additional services related to data centers.
- **Robi Axiata (Axentec)**: established a data center in Bangladesh to enhance the digital infrastructure of the country.

3. **Emerging Players**:

- **Data Center Operators**: Several new entrants are emerging in the Bangladeshi data center market, including local startups and international investors looking to capitalize on the growing demand for data infrastructure. These players are investing in state-of-the-art facilities and sustainable technologies to differentiate themselves in the market.
- **Telecom Providers**: Major telecom operators like Grameenphone and Robi are also expanding their data center operations. They are integrating data centers with their telecommunications infrastructure to offer enhanced services to their customers.

These companies contribute to Bangladesh's data center industry's expansion and growth, supporting the nation's economic and digital transformation.

3. Infrastructure and Technology:

Power Supply

To ensure their continuing operation, data centers need a dependable and redundant power supply. To avoid downtime in the event that one transformer breaks, they are usually connected to the main grid via multiple transformers. Usually fuelled by petrol or gasoline, backup generators offer extra security during blackouts. Data centers, containing an organization's computer systems, IT operations, and related parts, are frequently referred to as the Internet's engine. A steady source of power is required for this engine to run smoothly, efficiently, and without any downtime. We give a brief synopsis and description of the key elements of the contemporary data center power infrastructure in this post.

Cooling System

Maintaining the ideal operating temperatures for data center equipment requires effective cooling systems. Liquid cooling, thermosyphon cooling, and computer room air conditioning (CRAC) units are examples of common cooling approaches. These devices aid in preventing overheating, which can result in deteriorated performance and hardware breakdowns.

Network Connectivity

To manage massive data volumes and enable real-time applications, data centers require dependable and fast network access. A spine-leaf architecture, which offers high bandwidth and low latency connectivity, is frequently used in modern data centers. By ensuring effective data flow and redundancy, this design improves scalability and fault tolera

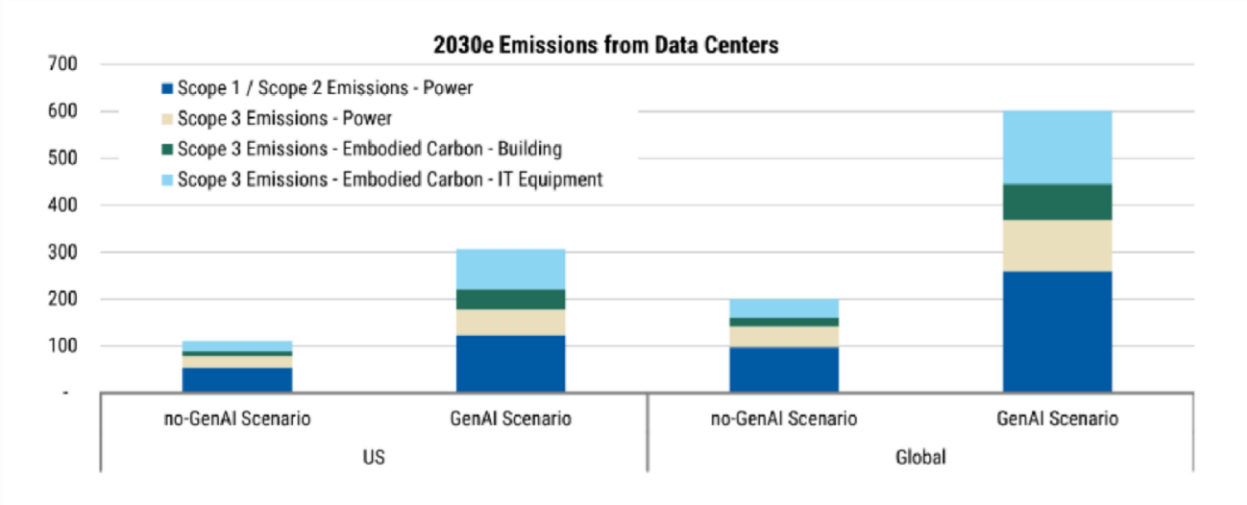
Energy Efficiency Measures and Sustainability

- The environmental effect of data centers can be greatly decreased by implementing energy-efficient measures. Important actions consist of:
- Optimized Cooling: Making use of cutting-edge cooling methods including liquid cooling, which outperforms conventional air cooling, and free cooling, which makes use of ambient air.
- IT equipment that is energy-efficient: Installing power-saving servers and storage systems.
- Renewable Energy: Using renewable energy sources to fuel data center operations, such as solar or wind power.
- Heat recovery is the process of gathering and repurposing waste heat produced by data center machinery for different uses, such as building heating.
- These actions lessen data center's carbon footprints, which promotes sustainability in addition to cutting energy usage and operating expenses.

4. Environmental and Sustainability Concerns

4.1 The Footprint of Data Centers in Bangladesh

The carbon footprint refers to the amount of carbon dioxide (CO2) and other harmful gases that data centers release into the environment. These gases contribute to global warming.



The graph you shared shows **projected emissions** from data centers by 2030 in the US and globally, under two scenarios:

1. **No-Generative AI (No-GenAI) Scenario**: This represents data centers functioning without the additional load from generative AI (like AIbased services and machine learning).
2. **Generative AI (GenAI) Scenario**: This scenario represents data centers with increased energy consumption due to generative AI processes.

Data centers consume large amounts of electricity, often from fossil fuels, significantly contributing to their carbon footprint. Globally, data centers are expected to emit billions of metric tons of carbon dioxide by 2030, driven by the rapid growth of artificial intelligence (AI) and cloud services. Although there is limited specific data on Bangladesh's data centers, it's evident that the expansion of digital services and infrastructure in the country will likely increase emissions if energy efficiency measures are not adopted.

4.2. Review Green IT and Sustainable Practices

We are proposing to use the following initiatives to make sustainable and profitable IT infrastructure in Bangladesh

1. **Green Building**- Green building especially recognized for its design development, or management that maximizes the site's potential, uses most of its energy. Provides water protection and conservation and also improves the quality of the indoor environment (IEQ).

2. **Eco Friendly Furniture**

   · We have identified non eco friendly furniture that are made of polycarbonate board, plastic board and heavy materials are used most of which are not recyclable.

   · Instead we can use cheap and also lightweight decomposable soil products such as wood, rattan and sea grasses made of natural resources.

3. **Clean Energy Usage**

   · Currently Bangladeshi data centers use direct electricity that is provided from pdb or gov't based power plants that produce electricity from pit-coal and natural gas. Use of natural gas emits GHG and co2 directly into the nature

   · The solution we recommend to decrease the use of direct electricity is **Solar Energy**. Many of the Bangladeshi industries

are using solar energy. Walmart, Target corporation are the leaders in this sector in providing solar energy. Walmart has been providing 350 rooftop solar installations and providing 349 MW electricity over the years.

4. **Energy Efficient Electronics and Hardware**

· **Energy Efficient Lighting-** LED bulbs utilize 25-30 percent less energy than regular energy bulbs and last 25 times more extensive and lasts up to 20 years.

· **Virtualization of Servers-** Old traditional servers usually having 4 cores and 4-8 threads consume 65-98W and then additional power for the motherboard. And the cpu is not utilized most of the timeBy replacing it with next generation server such as AMD which has 64 cores and 128 threads per processors, can be easily virtualized and act like 64 different computers. Which consumes 225-280W meaning 3.5-4.5W per core.

· **Cloud Computing-** Data center's involving non relevant work involving the core data center works can be done using cloud computing. Which provides an infinite amount of storage and softwares. Which would reduce costs and usage of power.

Current Green Initiatives:

Some companies are exploring green IT practices, such as using energyefficient cooling technologies and renewable energy sources like solar or wind.

However, these initiatives are still in their early stages in Bangladesh. International tech companies like Amazon, Microsoft, and Google are taking steps to offset their emissions globally, including through carbon removal technologies and renewable energy purchases, but these efforts have yet to be widely implemented locally in Bangladesh.

Government Initiatives:

- **Digital Bangladesh Vision**: Promotes sustainable IT and energyefficient data centers.
- **Energy Conservation Plan**: Encourages energy efficiency in IT infrastructure.
- **E-Waste and Data Protection Laws**: Focus on responsible e-waste management and sustainability.

Private Sector Efforts:

- **Green Data Centers**: Investment in energy-efficient data centers with renewable energy integration.
- **Solar Energy**: Adoption of solar power to reduce reliance on traditional energy sources.
- **Efficient Hardware**: Virtualization and energy-saving equipment to lower power usage.

International Collaborations:

- **Partnerships with Global Tech**: Global companies promote cloud solutions and energy-efficient practices.
- **Donor Support**: International projects focus on green energy and sustainable IT development.

Sustainability in Data Centers:

- **Advanced Cooling**: Energy-efficient cooling systems like liquid cooling and hot/cold aisle containment.
- **PUE Monitoring**: Focus on improving Power Usage Effectiveness (PUE).
- **E-Waste Recycling**: Initiatives for recycling outdated IT equipment

5. Challenges and Opportunities

5.1 Identify key challenges facing data centers in Bangladesh, including energy issues and regulatory hurdles.

1. **Energy Issues-** One of the major challenges for data centers in Bangladesh is the **unstable power supply**. Data centers require constant and reliable energy to function, but frequent power outages and reliance on nonrenewable energy sources, like coal and gas, increase operational costs and carbon emissions. Backup solutions, such as generators, further contribute to environmental degradation.

Cooling requirements also pose significant challenges. Efficient cooling systems are essential to prevent overheating, but they consume large amounts of energy, increasing both expenses and the overall carbon footprint

Data center operations can be disrupted by frequent power outages and voltage fluctuations, despite the use of backup generators and UPS systems. In one case we have identified Robi Axiata's data center uses ups that provides 30 minutes and the generator can provide 36 hours of backup[1].

2. **High Energy Costs-** Another study says Bangladesh telco Grameenphone consumes 4 MW of electricity that would cost bill of **850k BDT** and Robi Axiata has 155 racks of channel each has the ability of 4KW which sums up **0.64MW** of electricity, and that costs around 150k BDT .

3. **Geographical Position-** As we all know Bangladesh is in a place where weather most of the time remains warm and hot. In these conditions it becomes very tough to keep the server racks cold. When the atmospheric role is not in favorable condition, many things go in opposite direction such as

a. Cost increases

b. Cooling outrages

c. Component damages etc.

While the Bangladeshi government is making efforts to improve the digital infrastructure, data privacy regulations are still developing. The absence of comprehensive laws for data protection and cross-border data transfers complicates the operation of data centers, especially for international companies looking to expand their services in the country.

Additionally, the **lack of skilled professionals** to manage advanced data center operations poses a challenge, as there is a significant skills gap in maintaining large-scale, energy-efficient data centers

5.2 Opportunities for Growth

5.2.1 Government Initiative

The **Digital Bangladesh** initiative by the government is driving the growth of the digital economy. The government is promoting the development of **hightech parks** and data centers with incentives such as **tax breaks** and reduced land costs. These initiatives are aimed at attracting both local and international investments, creating a favorable environment for data center growth.

1. Digital Bangladesh Vision- The government's "Digital Bangladesh" initiative aims to improve digital infrastructure across the country. Which improvises investments in the sector of technology infrastructure, which will expand the environment for data centers and technology infrastructures.

Policies that encourage the development of IT parks, technology hubs, and data centers through incentives and regulatory support can drive growth in the sector.

2. Increase Employment- As the government is concerned about employment, this creates a certain amount of IT roles for professionals. Data centers require a lot of technical staff who are in the IT sector, as well as admin and logistics support. These are the direct propositions that creates employment through this.

And indirect employment, you can see data centers not only need technical staff, also non technical staff members who are recruited in the project. Also building the infrastructure and maintenance includes more.

3. **Educational and Training Programs**- Government-supported training programs and educational partnerships can create a skilled workforce for the data center industry, enhancing job readiness and career opportunities. For It graduates data centers open a whole new sector of job and experience opportunities.

4. **Government Rules and Regulations**- Government issued policy and terms of conditions determines the monitoring and concern at data center oriented business which inspires stakeholders to get more involved in the context. As a result investors are more inspired to invest in this sector which will uplift our data center oriented business's globalization.

5.2.2 Expansion of 5G

- The upcoming rollout of **5G technology** will significantly enhance **internet speed** and **network reliability** across Bangladesh. This will lead to the adoption of advanced services such as **cloud computing**, **IoT (Internet of Things)**, **online gaming**, and **AI-based solutions**, which require high-speed, low-latency networks and reliable data storage solutions.
- 5G is expected to support edge computing (**Edge computing** is a distributed computing model that brings data processing and storage closer to the location where it is generated, rather than relying on

centralized cloud data centers.), which allows data processing closer to the source of data generation, reducing latency. This creates a demand for micro data centers to handle real-time data processing near the users, especially in sectors like telecom, media, and retail.

- As Bangladesh transitions to 5G, the **IT and telecom sector** will increasingly rely on data centers for storing and managing the vast amounts of data generated by **connected devices**. This presents an opportunity for building more **energy-efficient data centers** to meet the growing data traffic while minimizing environmental impact.

6. Conclusion

6.1. Key Findings

- **Revolution in IT sector-** Since the first data center was established by servershed,the demand in digital services has grown later in 2010 BDCloud. Data Center Bangladesh entered the industry. Currently having 8 data centers in the country providing mountains of job, skill and research opportunities.

- **Government Vision**- Creating opportunities in the sector of Data infrastructure opens new doors to the future IT sector towards the aim of Digital Bangladesh. Government has already provided rules and regulations on the context of the data center.
- **Challenges in Creation of Green Data Center-** As cooling is one of the major issues in a data center, we have already spoken about the geographical position of our country, as the climate remains hot for a certain amount of time, the expense of cooling becomes higher causing the imbalance in the revenue.

- **Importance of Green IT infrastructure-** As we have already seen the carbon footprint which has a direct and indirect influence in the harmful GHG emission in the atmosphere we are proposing the use of green components and renewable energy to minimize the impact upon nature.

6.2. Recommendations

The report recommends several strategic recommendations for Bangladesh's data centers. These include adopting renewable energy solutions like solar power integration, integrating hybrid power systems, enhancing cooling efficiency through advanced cooling technologies, and implementing hot/cold aisle containment. Investing in energy-efficient hardware, optimizing Power Usage Effectiveness, and investing in network redundancy and connectivity are also crucial. Green IT practices, such as e-waste management and sustainable supply chains, are also recommended. Collaboration with global cloud providers and public-private partnerships is also suggested. Government policies for sustainability, such as regulatory support and a national data center strategy, should be introduced. These recommendations aim to improve operational efficiency, sustainability, and competitiveness in the global digital economy. By implementing these practices, Bangladesh's data centers can position themselves as key enablers, mitigating environmental impact, reducing costs, and enhancing the country's competitiveness in the global market.

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