

Report On

**Sustainable Practices: A study in the context of  
construction project under Public Works Department  
(PWD).**

By

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An internship report submitted to the BRAC Institute of Governance and Development  
(BIGD) in partial fulfillment of the requirements for the degree of  
MASTERS IN PROCUREMENT AND SUPPLY MANAGEMENT (MPSM)

BRAC Institute of Governance and Development (BIGD)

BRAC University

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## Declaration

It is hereby declared that

1. The internship report submitted is my original work while completing degree at BRAC University.
2. The report does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The report does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

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## Letter of Transmittal

Mir Mehbubur Rahman  
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Subject: Sustainable Practices: a study in the context of construction project under Public Works Department (PWD).

Dear Sir,

It is an immense pleasure to present my project report. This report was prepared through the analysis of sustainability practices during contract phases. During this period, I learned a lot and applied my knowledge and skills to generate the report. I made every effort to gather information for this report in order to provide in-depth knowledge. I hope that this report meets the requirements and provides insight from an organizational standpoint. Hopefully, you will find my work, efforts, informative approach, and well-researched report useful.

Sincerely yours,

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Anik Das Gupta

21282020

BRAC Institute of Governance and Development (BIGD)

BRAC University

Date: August 23, 2023.

## **Non-Disclosure Agreement**

This agreement is made and entered into by and between the Public Works Department as the First Party and the undersigned student at BRAC Institute of Governance and Development, BRAC University, as the Second Party. The First Party has granted the Second Party permission to prepare a report on Sustainable Practices: a study in the context of a construction project under the Public Works Department (PWD) as a partial fulfillment of the requirements for the degree of Masters of Procurement and Supply Management. The Second Party will have the opportunity to work closely with the organization's officials and access official data and information. Based on work experience, data, and information collected, the Second Party will prepare a report. The Second Party will utilize all sorts of data and information for academic purposes and will not disclose it to any party that could be detrimental to the interests of the First Party.

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## **Acknowledgement**

At first, I would like to express my sincere thankfulness to God for granting me the ability to successfully complete this project study.

I owe my supervisor a huge debt of appreciation and I'd like to express my heartfelt gratitude to my academic supervisor Mir Mehbubur Rahman, MCIPS, Senior Trainer, BRAC Institute of Governance and Development (BIGD), BRAC University and workplace supervisor Himel Das, Sub-Divisional Engineer, Public Works Department for his unwavering support, generous assistance, constructive comments, and invaluable suggestions all through the work's progress.

I would really like to thank the officers and staff of BIGD, BRAC University, particularly Dr. Rajmoni Singha, Academic Coordinator, BIGD and Tanzina Mizan, Training Officer, BIGD, BRAC University, for her unwavering support throughout the study period.

I also would like to express my heartfelt gratitude to the respondents of the Public Works Department (PWD), notably Executive Engineers, Sub-divisional Engineers, and Assistant Engineers from various PWD offices who assisted me at various phases of the data collection and provided numerous official supports.

Finally, I'd like to thank my parents, wife and colleagues for their constant encouragement and support throughout the study.

## **Executive Summary**

Public Works Department (PWD), under the Ministry of Housing and Public Works, is the pioneer in construction arena of Bangladesh. Over about two centuries, PWD could successfully set the trend and standard in the country's infrastructure development. Sustainability is a major concern of Bangladesh Government nowadays. Similarly, PWD has been trying to incorporate the sustainability issues in their procurement activities, construction projects as well as their mission and vision. In order to prepare this report, some of the Executive Engineers and Sub-Divisional Engineers had been contacted who are directly working in field level. From them, the recent sustainability practices being done in the construction projects have been identified and discussed. Few data of both ongoing and finished projects in Dhaka District have been used in this report. The officers shared the present scenario in field level. All of them shared an opinion like that: sustainable policy considers people, planet and profit, whereas the traditional policy focus on cost minimization; which are completely contradictory. So before implementing sustainable policy the most important factor is the proper and true concept of sustainability through the whole supply chain. In short, it can be said that sustainability is a strategic issue. To implement this issue in field work, it needs proper plan, skilled manpower, culture and mindset.

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## **List of Acronyms**

PWD Public Works Department

SOR Schedule of Rates

SDG Sustainable Development Goal

STP Sewage Treatment Plant

PV Photovoltaic

LED Light Emitting Diode

EE Executive Engineer

SDE Sub-Divisional Engineer

BMS Building Management System

DC Direct Current

RHD Roads and Highways

LGED Local Government Engineering Department

BWDB Bangladesh Water Development Board

BPDB Bangladesh Power Development Board



# Chapter 1: Introduction

## 1.1 Background:

The Public Works Department (PWD) in Bangladesh operates under the Ministry of Housing and Public Works. It is responsible for planning, designing, constructing, and maintaining public infrastructures and buildings. Through its work, the PWD contributes to the research, analysis, and development of physical infrastructure in Bangladesh. But the procurement and construction practice are here almost traditional. The culture of sustainability is not developed here as much as it is supposed to be. The modern trend is to be sustainable in every aspect. All the organizations now believe that sustainability gives them a competitive advantage. In Bangladesh, private sectors are very much aware regarding sustainable issues and they are far ahead compared to the public organizations. It is true that public organizations have strong norms and they value establishing the status quo. They try to maintain stability and predictability. They have a fear of the unknown and insecurity to break the traditional practices. So, there is always a higher resistance (both individual and organizational) against bringing any change in government organization. Those are the reasons why public sector is lagging behind adopting sustainable practice. From the last few years Government is interested in adopting sustainable practices. Bangladesh actively participates in the pursuit of the United Nations' Sustainable Development Goals (SDGs). The SDGs are a set of 17 global goals aimed at addressing social, economic, and environmental challenges to achieve a sustainable future by 2030. All the government organizations are now trying to incorporate sustainable issues in their policy. PWD, RHD, BWDB, LGED, and PDB are the government engineering

departments in Bangladesh. They all are now creating awareness and incorporating sustainable policy in their vision and mission. PWD is also trying to adopt sustainable issues in their bidding process, contract management process, design and construction phase etc. The next chapter of this report will focus on the current practices regarding sustainable practices which are being followed by PWD.

## **1.2 Sustainable Practice:**

Sustainable practice or sustainability means meeting one's own needs without compromising the ability of future generations to meet their needs. Meeting own needs mean the need arises in present time. Previously it can be seen that the practice of every organization is to make profit without compromising the nature and human being. Actually, they were not familiar with the word sustainability that time. But the recent practice is totally different. Organizations are considering environmental and social factors beside the economic factor which is profit. Taking into consideration all these three factors (people, planet and profit) give any organization competitive advantage to sustain its existence over the decade. Sustainable practices in construction projects refer to the implementation of strategies and methods that aim to minimize negative environmental impacts, promote resource efficiency, and enhance social and economic benefits throughout the project's lifecycle. These practices prioritize the responsible use of resources, reduction of waste and pollution, and the creation of environmentally-friendly and energy-efficient structures.

## **1.3 Why sustainability is important:**

Sustainability is crucial for several reasons, as it addresses the pressing challenges and opportunities which are being faced in the world today. Here are some key reasons why sustainability is important:

**1.3.1 Environmental Protection:** Sustainability promotes the responsible use of natural resources, safeguards ecosystems and biodiversity, and minimizes the negative impacts of human activities on the environment. By preserving the planet's health, it is possible to secure a sustainable and livable future for generations to come.

**1.3.2 Climate Change Mitigation:** Sustainability plays a vital role in addressing climate change which is one of the most significant global challenges. By promoting sustainable practices and reducing greenhouse gas emissions, it is possible to minimize the impacts of climate change, such as extreme weather events, rising sea levels, and disruption of ecosystems.

**1.3.3 Resource Conservation and Efficiency:** Sustainable practices emphasize efficient/optimum use and management of resources like water, energy, and raw materials. By adopting sustainable approaches, it is possible to reduce waste, minimize resource depletion, and ensure their availability for future generations.

**1.3.4 Economic Stability and Resilience:** Sustainability is essential for long-term economic stability. By incorporating sustainable practices in business operations, supply chains, and investments, it is possible to reduce risks, improve efficiency, and enhance economic resilience. Sustainability can also drive innovation and create new opportunities for economic growth and job creation.

**1.3.5 Reputation and Brand Value:** Embracing sustainability can enhance the reputation and brand value of organizations. Consumers, employees, and investors are increasingly seeking socially and environmentally responsible companies. Companies having strong CSR are more attractive to its all stakeholders.

Sustainability is vital as it guarantees the well-being of the planet, shields the environment, promotes social equity, fosters economic stability, and tackles global challenges. By adopting

sustainable practices, it is possible to create a resilient, prosperous, and inclusive world for present and future generations.

#### **1.4 Sustainable practices need investment:**

To adopt sustainable practice an organization needs initial investment which seems a common obstacle. It is true that the amount of initial investment is huge (because it requires new technology and skilled manpower, focuses on resource optimization, encourages innovation and research) but it reduces the whole life cycle cost as well as saves the resources, environment, increases the longevity of the structure. As sustainable practice is a strategic issue, people have to think for a longer period to bring a positive result rather than a dramatic change.

## Chapter 2: Literature Review

Sustainability is a concept that encompasses the responsible and balanced use of resources to meet the needs of the present without compromising the ability of future generations to meet their own needs. It involves considering the economic, social, and environmental impacts of people's actions.

The Triple Bottom Line (TBL) or 3Ps framework is a widely used approach for evaluating and understanding sustainability. It was introduced by John Elkington in the early 1990s and emphasizes three key dimensions:

**People:** This dimension focuses on the social aspects of sustainability. It involves ensuring that business practices are fair, just, and benefit society as a whole. This includes factors such as labor practices, human rights, community engagement, and stakeholder well-being.

Companies that prioritize the "People" aspect of TBL invest in their employees, support local communities, and contribute to social development.

**Planet:** This dimension addresses environmental concerns. It emphasizes the need to protect and preserve natural resources and ecosystems. This includes efforts to reduce pollution, conserve energy, manage waste, promote biodiversity, and combat climate change.

Businesses that prioritize the "Planet" aspect of TBL adopt eco-friendly practices, implement sustainable resource management, and work towards minimizing their environmental footprint.

**Profit:** This dimension represents the economic viability and long-term sustainability of a business. It involves generating profits and economic value while simultaneously considering the interests of all stakeholders, including shareholders, employees, customers, and the broader community. Companies that focus on the "Profit" aspect of TBL aim for financial success through ethical and sustainable business practices.

The TBL framework encourages organizations to think beyond short-term financial gains and consider the broader impacts of their actions. It emphasizes that economic success should not come at the expense of social and environmental well-being.

Overall, the concept of sustainability, as encapsulated by the Triple Bottom Line or 3Ps, encourages a holistic approach to decision-making, where economic, social, and environmental considerations are balanced for the long-term benefit of all stakeholders and the planet.

## **Chapter 3: Methodology**

The objective of this report is to find out the recent practices of sustainability in the construction projects of Public Works Department as well as the challenges the field Engineers have been facing to comply with the sustainability issues. Data used in this report have been collected through face-to-face interview and over the phone with the field engineers namely the Executive Engineers and Sub-Divisional Engineers who are Grade-5 and Grade-6 officers of the People's Republic of Bangladesh. Approximately six engineers were interviewed for the data/information collection including the workplace supervisor of the report. The list of questions asked during the data collection phase are being enclosed in the appendix.

## Chapter 4: Findings: Sustainable Practices in PWD

PWD is constructing the government infrastructures in district level on behalf of different government organization. From preparing the rough estimate to hand over the projects there are different level of activities. Now the sustainability practices followed by PWD in construction projects are going to be discussed:

### 4.1 Sewage treatment plant (STP):

A sewage treatment plant (STP) is a specialized facility that processes wastewater from various sources, including residential, commercial, and industrial areas. Its main objective is to remove pollutants and contaminants, ensuring the treated sewage can be safely released into the environment or used for non-drinking purposes. Sewage treatment plants play a vital role in protecting public health and the environment by preventing the release of harmful pollutants into water bodies. Properly treated sewage helps maintain water quality, preserves aquatic ecosystems, and reduces the risk of waterborne diseases.

#### 4.1.1 Why STP can be a sustainable option:

A well designed and properly operated sewage treatment plant definitely is a sustainable option for various reasons.

**Environmental protection (Environmental aspect):** Discharged water from STP contains less contaminants and pollutants as it purifies the waste water in various stages during operation. Thus, it helps to prevent water pollution and minimize the negative impact on ecosystem and biodiversity.



**Resource conservation (Environmental aspect):** STP encourages recycle and reuse of water. Treated waste water, known as effluent, can be used in irrigation, industrial processes, even drinking purpose where there is water scarcity. Thus, it promotes responsible water management.

**Energy generation (Environmental aspect):** STP with advanced technology generate biogas (methane) from the sludge during the treatment process. This biogas can be used to generate electricity which contributes to energy sustainability.

**Public Health Improvement (Social aspect):** Proper treatment of sewage prevents the spread of waterborne diseases, contributing to improved public health and sanitation. This is particularly significant in densely populated areas where untreated sewage can pose significant health risks.

#### **4.1.2 Practices in PWD:**

PWD has given importance to build STP in their recent projects. While preparing DPP, STP is being included if the end user is generally more than 800 people. So, the waste water produced by the end users is being treated and then it is discharged. PWD builds STP under the 288 flat construction projects for Government officers in Mirpur 6 no section, Judges complex project in Eskaton. There is a project running under divisional jurisdiction named Up-gradation of Sarkari Karmachari Hospital to 500 bedded Hospital (1st revised) where PWD is going to construct a STP. As it is a hospital the waste water is more hazardous than a residential one. So, construction of STP saves the water pollution in a great extent. In Bangladesh, the use of effluent is not that much encouraged as there is not that much scarcity of water. But with the passage of time water will be decreased. The level of ground water has been decreasing day by day. So, the purpose of STP is not fully served except it saves water pollution. The culture of

using the effluent discharged from STP should be grown up like the modern country does so that the full purpose of a STP can be achieved.

## **4.2 Non fire Bricks:**

Bricks are one of the oldest and most widely used building materials in construction. PWD has been using bricks in all its construction projects as they build RCC structure rather than steel structure. But the production of brick has a huge negative impact on the nature. It results air pollution, greenhouse gas emission, deforestation, soil degradation, water and energy consumption. The Government of Bangladesh has been promoting the use of non-fire bricks instead of the traditional bricks. Incentives, policies, and regulations are being introduced to encourage the adoption of cleaner and more sustainable technologies in the brick-making industry. Production and use of non-fire bricks has been introduced already but it takes a lot of time.

### **4.2.1 Why non fire brick can be a sustainable option:**

Non-fire bricks, also known as fly ash bricks or concrete bricks, offer a sustainable option for construction when compared to conventional clay bricks. Their environmentally friendly attributes are highlighted by the following reasons:

**Resource Conservation & waste reduction (Environmental aspect):** Non-fire bricks are typically made from industrial by-products such as fly ash, a waste material generated from coal-fired power plants. By utilizing these by-products as raw materials, non-fire bricks help reduce the demand for traditional clay, conserve natural resources as well as reduce the waste as the by-products are used as raw materials.

**Energy Efficiency (Environmental aspect):** The production of non-fire bricks involves a lower energy footprint, leading to reduced greenhouse gas emissions and less environmental impact.

**Reduced Air Pollution and lower carbon footprint (Environmental aspect):** The production of non-fire bricks generates fewer air pollutants compared to traditional clay brick manufacturing, which involves the combustion of fuel in kilns. As a result, non-fire brick production contributes to better air quality and reduce the carbon footprint.

#### **4.2.2 Practices in PWD:**

PWD has been using non fire bricks in its project in a small scale since few years. The amount of non-fire bricks must be 10% of total bricks required which is the current practice and it is maintained very strictly. It is monitored and reported very strictly. In every month the field office has to report to the higher authority about the use of non-fire bricks. From using fire bricks to non-fire bricks, it will take time as it is a change programme. Resistance has been come from the manufacturer to contractor but Government has been trying to manage it tactfully. Government encourages the manufacturer to produce environment friendly bricks by incentives, tax advantage etc. Government aims to use 100% non-fire bricks within 2025 in all its construction project.

#### **4.3 Rainwater harvesting:**

Rainwater harvest is a simple method of collection and storage o rain water, rather than allowing it to run off. It captures and stores rainwater for diverse uses, preventing wastage and offering an effective and eco-friendly water management solution. It is a very simple and old method of collecting rain water.

##### **4.3.1 Why rainwater harvesting is a sustainable option:**

Rainwater harvesting is a sustainable practice that aligns with the principles of water conservation and environmental protection. It conserves water resources, reduces the burden on freshwater sources, and helps in managing water scarcity during dry seasons. By reducing runoff, rainwater harvesting helps to prevent soil erosion and flooding, while also recharging

groundwater aquifers. It aligns with the reduce, recycle and reuse concept. Those are the reasons behind rainwater harvesting is a sustainable option.

#### **4.3.2 Practices in PWD:**

PWD includes rainwater harvesting in most of its construction projects. Maximum residential buildings constructed by PWD have rainwater harvesting system. To carry the rain water, pipes are being installed at the rooftop. Rainwater carried by the pipes are directly discharged into the filter. After the filtering process water is sent to the underground reservoir for the final use as drinking water, domestic use etc.

#### **4.4 Solar panel:**

Solar panels, also known as photovoltaic (PV) panels, are devices that convert sunlight into electricity. Solar panels are made up of multiple solar cells, typically made of silicon, that capture sunlight and produce direct current (DC) electricity.

##### **4.4.1 Why Solar panel is a sustainable option:**

**Renewable Energy (Environmental aspect):** Solar panels uses sunlight, a renewable energy source. By converting sunlight into electricity without consuming finite resources, it helps to reduce dependence on fossil fuels, which are non-renewable and contribute to greenhouse gas emissions.

**Reduced Carbon Footprint (Environmental aspect):** Solar panels generate electricity without emitting greenhouse gases, such as carbon dioxide, methane, which are major contributors to global warming and climate change. Using solar energy reduces the carbon footprint of electricity generation, contributing to climate mitigation efforts.

**Energy Independence (Social aspect):** By utilizing solar panels, individuals, businesses, and communities can generate their own electricity.

**Low operating cost (Profit aspect):** Once installed, solar panels have low operating and maintenance costs compared to traditional fossil fuel-based power plants. This cost-effectiveness makes solar energy an attractive and sustainable choice for electricity generation.

#### **4.4.2 Practice in PWD:**

PWD has started the solar panel practice in their various residential projects. PWD installs solar panel in Jhiga3tola Officer's quarter project of 15KW where the solar energy meets the common space energy consumption and the rest portion directly contributes to the main line, in Mirpur 288 officer's flat projects. In upgradation project of Sarkari Karmachari Hospital a on-grid solar panel will be installed of 20KW. The power produced by the solar panel mainly contributes to the common space demand. Moreover, PWD uses the modern solar panel system where dry type transformer is used which requires air as cooler instead of oil.

#### **4.5 LED lights:**

LED (Light Emitting Diode) lights are a type of lighting technology that converts electrical energy into visible light through the process of electroluminescence. LEDs have become increasingly popular as a sustainable and energy-efficient lighting solution.

##### **4.5.1 Why LED is a sustainable option:**

LED is considered a sustainable option for lighting. LED lighting technology has several features that make it an environmentally friendly and energy-efficient choice:

**Energy Efficiency (Environmental and social aspect):** LED lights are highly energy-efficient, consuming significantly less electricity compared to traditional incandescent or fluorescent bulbs. This leads to lower energy consumption, reduced greenhouse gas emissions, and lower electricity bills.

**Long Lifespan (Environmental and economic aspect):** LED lights have a much longer lifespan compared to traditional bulbs. They can last up to 25 times longer, reducing the frequency of replacements and the amount of waste generated from discarded bulbs.

**Reduced Waste (Environmental aspect):** Due to their long lifespan, LED lights contribute to waste reduction. Fewer bulbs need to be manufactured, reducing the consumption of raw materials and the energy required for production.

**Mercury-Free (Environmental and social aspect):** Unlike fluorescent bulbs, which contain mercury, LED lights are mercury-free, making them safer for both the environment and human health.

#### **4.5.2 Practice in PWD:**

PWD has started the practice of using LED lighting system in construction projects such as Judges Complex Project, 20 storied newly constructed office building at Bangladesh Secretariat. In upgradation project of Sorkari Karmachari Hospital (Government Employee Hospital) LED light will be used. PWD has also emphasized in cross ventilation system which allows more day light in the buildings as well as introduced automated sensor which reduces loss of power. Newly constructed BTRC building (not inaugurated) can be a wonderful example of cross ventilation.

#### **4.6 Procurement challenges:**

PWD has its own Schedule of Rates (SOR). It is a book published by the department in every 4 years interval. It aims to reflect the present representative market prices of materials, goods and labour. It includes new items to adapt to advancement of new technologies and materials. Other engineering departments also follow this SoR. It saves time to prepare an estimate as most of the items are being included with market price. But the main challenge is the price of the materials are increasing day by day. Engineers of PWD can not take the market price if the

item is already being included in their SoR. In many of PWD's projects it can be seen that the project was approved following a SoR of that time but bidding and implementation was done following another SoR. Model mosque project is a big example of this incident. Many of the contracts are being terminated due to the price increased. Engineers sometimes can not include new technology or better items if similar items are already in the SoR. In tender evaluation stage there is no weightage system if the tenderer follows more sustainable issues. Recently the weightage system has been introduced in some foreign aided project. Moreover, there are a shortage of specification writer in the government sector. In tender preparation stage PWD sometimes fail to prepare a strong specification as a result tenderers take that advantage. From tender preparation to contract management overall scenario is not that much satisfactory with the sustainable policy. Engineers are facing huge challenges in procurement with complying with sustainability. But at the end of the day the good sign is PWD has been started the sustainable culture as much as they can.

## **Chapter 5: Recommendations & Conclusion**

Sustainability is a concept which involves people, planet and profit. It is impossible to achieve day night. It is a matter of strategic issue. Any strategic matter need time, proper planning, skilled men power and a culture.

### **5.1 Recommendations:**

**5.1.1** Good sign is Public Works Department is concerned with sustainable practice not only in construction projects but also in all the activities. Department has been trying to communicate the concept with its top management. But when the total chain is taken into consideration, the concept must be communicated from upstream to downstream which will take time as it is a change programme.

**5.1.2** If the supply chain of Public Work Department is being considered, officials are in the upstream and end user are in the downstream. Sustainable concept must be communicated in each part of the chain. But there is a gap in the awareness issue among the suppliers and contractors. They give more focus on the profit issue compared to other two pillars of sustainability. From their end they are correct. But when the whole chain is being considered, it creates conflict. So, sustainable policy must be incorporated in the procurement guideline so that contractors will be interested to make their supply chain sustainable. Giving extra weightage in CSR and sustainability issues while preparing and evaluation bid encourages the contractor to make their own supply chain sustainable.

**5.1.3** Sustainable procurement emphasizes on whole life cycle cost where traditional procurement focuses on lowest cost. Both are just two poles of magnet. Shifting towards sustainable procurement must bring a huge change and any change policy must face resistance.



So, while focusing on sustainable policy, the policy maker must create a mindset, a culture of accepting sustainability.

**5.1.4** Building management system (BMS) could be a great sustainability practice. In building management system consumption of power is controlled by sensor system. Power is being consumed when it is necessary. It enhances energy efficiency, reduces operational costs, and supports sustainable practices by ensuring that resources are used only when necessary. If BMS can be implemented in our construction projects, it will prevent the waste of resources like electricity, water undoubtedly.

**5.1.5** PWD follows a rate schedule for their civil and electro-mechanical works. Engineers prepare estimate based on the SoR for the next four years. As the prices of materials fluctuate daily, contractors sometimes feel discourage to follow that rate. So, it will be better to prepare estimate based on the current market rate. During the interview some of the engineers also suggest this strongly.

## **5.2 Conclusion:**

In summary, this study has highlighted the essential significance of sustainable practices in construction projects managed by the Public Works Department (PWD). The investigation has vividly showcased how these practices play a crucial role in influencing the direction of infrastructure development. The research robustly emphasizes the broad benefits derived from incorporating sustainable principles into PWD managed construction endeavors. Looking ahead, it's crucial to realize that integrating sustainable practices into PWD construction projects is not a choice but a necessity. Research findings strongly support the continuous advancement of policies prioritizing sustainable development. By embracing these insights, the Public Works Department can spearhead transformative efforts that safeguard the environment and enhance future generations' quality of life.

## **Appendix-A**

### **Sample Interview Questions**

1. What is the present scenario of sustainability in Public Works Department?
2. How does the recent practice justify the triple bottom line (TBL) concept?
3. What are the procurement challenges faced by the Engineers of PWD?