



# **Imagining the Wind: Exploring the Sociotechnical Barriers and Potentials of Wind Energy in Bangladesh**

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Independent project • 30 credits

Swedish University of Agricultural Sciences, SLU

Faculty of Natural Resources and Agricultural Sciences

Rural Development and Natural Resource Management - Master's Programme

Uppsala 2025



# Imagining the Wind: Exploring the Sociotechnical Barriers and Potentials of Wind Energy in Bangladesh

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<b>Credits:</b>	30 credits
<b>Level:</b>	Second cycle, A2E
<b>Course title:</b>	Master thesis in Rural Development
<b>Course code:</b>	EX0889
<b>Programme/education:</b>	Rural Development and Natural Resource Management - Master's Programme
<b>Course coordinating dept:</b>	Department of Urban and Rural Development
<b>Place of publication:</b>	Uppsala
<b>Year of publication:</b>	2025
<b>Copyright:</b>	All featured images are used with permission from the copyright owner.
<b>Online publication:</b>	<a href="https://stud.epsilon.slu.se">https://stud.epsilon.slu.se</a>
<b>Keywords:</b>	Wind energy, Bangladesh, energy transition, sociotechnical imaginary (STI), renewable energy policy, stakeholder perceptions

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# Abstract

Energy security is a critical issue for the overall development of a small but densely populated country like Bangladesh. On the other hand, issues such as climate change and global warming are placing greater emphasis on producing and using clean energy. Wind energy can be a good alternative for Bangladesh in terms of low land use, reduced dependence on fossil fuels, and clean energy production. This thesis explores the challenges and opportunities of adopting wind energy in Bangladesh, where fossil fuel reserves are depleting, land is scarce, and the impact of global warming is increasing, including the urgent need for sustainable energy. Despite the considerable potential of wind energy, according to a joint study by the National Renewable Energy Laboratory (NREL) and the United States Agency for International Development (USAID) and other existing studies, Bangladesh is still in its infancy in terms of large-scale wind energy deployment. The study investigates the technical, economic, institutional, and socio-cultural barriers to wind energy development based on data collected from semi-structured interviews with multiple stakeholders through a qualitative approach, analysing opinions and policy documents.

I also found that very little research has been conducted on wind energy adoption in Bangladesh from a social science perspective. Therefore, the study draws on two social science concepts; sociotechnical imaginary (STI) and materiality, to illustrate the barriers and potentials of wind energy adoption in Bangladesh. I use the sociotechnical imaginary (STI) framework to analyse how visions of the energy future are constructed, negotiated, and contested among donors, policymakers, experts, and the public. The findings reveal a disconnect between technocratic imaginers, which focus on data-driven planning and global sustainability goals, and weak social imaginers who reflect public scepticism and limited awareness. The concept of materiality is used to show how material constraints of wind power, such as inadequate infrastructure, insufficient wind resource data, and institutional inefficiencies, further hinder progress.

Despite these challenges, observations from interviews and secondary data suggest that emerging government and international policy interest, donor support, and successful pilot projects indicate a new momentum for wind energy in Bangladesh. Finally, this thesis concludes by arguing that a pluralistic and inclusive approach that integrates local knowledge, public engagement, and institutional reform is essential to realize the full potential of wind energy in Bangladesh and ensure a just energy transition.

**Keywords:** *Wind energy, Bangladesh, energy transition, sociotechnical imaginary (STI), renewable energy policy, stakeholder perceptions*

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# Abbreviations

Abbreviation	Description
ADB	Asian Development Bank
BPDB	Bangladesh Power Development Board
COP	Conference of the Parties
NDC	Nationally Determined Contributions
NREL	National Renewable Energy Laboratory
PSMP	Power System Master Plan
SDG	Sustainable Development Goals
SREDA	Sustainable and Renewable Energy Development Authority
STI	Sociotechnical Imaginary
SURE	Scaling Up Renewable Energy
USAID	United States Agency for International Development



# 1. Introduction

This thesis explores the adoption of wind energy as a critical component of the transition to sustainable, fossil-free energy sources in Bangladesh and, in doing so, it highlights the obstacles and possibilities of harnessing wind energy in Bangladesh. The introduction chapter outlines the global urgency of renewable energy, emphasising the role of wind energy as a viable and untapped resource in Bangladesh. It provides context for the country's growing energy demand and limited wind energy development, despite its considerable potential. The chapter identifies key research gaps related to societal perceptions, policy barriers, and infrastructural challenges, which lead to the formulation of the research objectives and questions. It concludes with the scope and structure of the study.

## 1.1 Research Background

Global electricity demand is anticipated to nearly double by 2040 and potentially triple by 2050, driven by rapid industrialization, population growth, and the increasing electrification of economies, particularly in developing nations (International Energy Agency, 2021). The growing demand for electricity, coupled with concerns over climate change, has driven a global interest in green and sustainable energy solutions. Renewable energy sources, such as solar, wind, and biomass, are increasingly recognised as essential to transitioning from environmentally harmful fossil fuels to cleaner alternatives. Among these, wind energy has gained prominence due to its minimal environmental footprint and its potential for large-scale energy generation, supported by rapid advancements in technology that have significantly reduced costs (DeCastro, 2019). The global wind industry installed a record 117 gigawatt (GW) of new capacity in 2023, marking its best year ever, according to the Global Wind Energy Council. This growth is fuelled by increased political ambition, including the COP28 target to triple renewable energy capacity by 2030 (Global Wind Energy Council, 2024). Countries like the United States, China, and Germany are leading the way in wind energy adoption, with global wind energy production distributed across more than 100 nations

(World Wind Energy Association). The top contributors include China (221 GW), the United States (96.4 GW), and Germany (59.3 GW). However, there remains a significant disparity in the adoption of wind energy between developed and developing countries (Zwarteveen et al., 2021). While developed nations invest heavily in wind farms and advanced turbine technology, developing countries face challenges such as limited resources, policy constraints, and competing priorities, often opting for less sustainable and more environmentally damaging energy sources (Global Wind Energy Council, 2021).

Bangladesh, with a population of over 166 million projected to rise to 189 million by 2041, exemplifies this disparity. The country faces immense challenges in meeting its growing energy needs sustainably. The energy mix as of 2018 was dominated by natural gas (64%), furnace oil (21%), and diesel (6%), with a small portion of renewable energy contributing at 0.1% (Power system master plan 2016). Moreover, Bangladesh's natural gas reserves are depleting rapidly, necessitating urgent exploration of alternative energy sources. Despite efforts to diversify its energy portfolio, the adoption of wind energy in Bangladesh has been slow. For example, two wind farms established in 2005 as part of a pilot project, one in Kutubdia Island with a 1-megawatt (MW) capacity and another in Muhuri Dam, Feni, with a 900 kilowatt (KW) capacity, added only 2 MW to the national grid and remain the country's sole operational wind energy projects to date. This stagnation persisted until 2017, when the government finally commissioned a comprehensive wind resource map after over two decades of intermittent monitoring (Babu et al., 2022). Finally, the "Cox's Bazar 60 MW Wind Power Plant", also known as "Khurushkul wind power plant" in Cox's Bazar, Bangladesh's first large-scale centralised wind power project, commenced operation in March 2024. By contrast, developed nations have made substantial progress, proving the feasibility of large-scale wind energy projects.

The situation in Bangladesh raises questions about why wind energy, despite its apparent potential, remains underutilized. Reports from the NREL and USAID in 2018 identified over 20,000 km<sup>2</sup> of land with the potential to harness wind energy, capable of generating 30 GW of electricity (Jacobson et al., 2018). However, debates among scholars reveal a lack of consensus on whether wind energy should

be prioritized over other renewable sources like solar and biomass. Preliminary insights suggest that this underutilisation may be due to a combination of technical limitations, policy gaps, infrastructural barriers, and limited public awareness. In particular, a fragmented regulatory landscape, inconsistent investment, and weak institutional capacity have hindered the progress of wind energy initiatives. This research aims to investigate the potential of wind energy in Bangladesh, identifying opportunities and addressing challenges.

## 1.2 Statement of the Problem

According to Power System Master Plan (PSMP) 2016, Bangladesh's ambitious vision to achieve high-income status by 2041 relies on ensuring a reliable and sustainable energy supply. Industrialisation and urbanisation are central to this vision, with energy demands projected to surge from 19,034 MW in 2021 to 82,292 MW by 2041 (Babu et al., 2022). However, the current energy infrastructure is ill-equipped to meet these needs. The country's reliance on fossil fuels, including natural gas and imported coal, poses significant environmental and economic challenges, including vulnerability to price volatility and environmental degradation. Furthermore, while nuclear energy is being explored as an alternative, recent studies show that concerns regarding safety, land suitability, and limited public understanding continue to constrain broader acceptance in Bangladesh (Hosan et al., 2023).

Although wind energy is often disseminated as a promising solution in Bangladesh, it still remains largely untapped. Challenges include a lack of policy prioritisation, insufficient investment, and scepticism about wind energy's feasibility in the local context (Das et al. 2023). Additionally, renewable energy projects like offshore wind farms face logistical and financial obstacles. For example, while countries with limited land resources like the Netherlands and Denmark have successfully implemented offshore wind projects (Zhang & Pollitt, 2023), similar initiatives in Bangladesh are still at a preliminary stage. Instead, environmentally damaging projects like the Rampal coal-fired power plant continue to receive government support.

These barriers are compounded by broader systemic issues, such as the lack of a cohesive energy strategy and limited public awareness about the benefits of renewable energy. Academic studies reflect this divide. While some researchers emphasize the technical and economic feasibility of wind energy in Bangladesh's coastal regions, others argue that resources should be allocated to solar energy or other renewables instead (Babu et al., 2022). This debate highlights the need for a comprehensive evaluation of wind energy's potential, particularly in comparison to other renewable options.

However, the barriers to wind energy adoption in Bangladesh are not merely technical or economic in nature, they also reflect deeper sociotechnical and cultural dimensions. Institutional inertia, policy incoherence, and infrastructure gaps intersect with societal imaginaries that prioritise fossil fuels and solar energy as more “practical” or familiar options. Consequently, this study approaches the research problem from both perspectives: examining the material and economic constraints that shape feasibility, and the sociotechnical imaginaries that influence how wind energy is envisioned, communicated, and accepted within policy institutions and the wider public sphere.

By exploring these interlinked dynamics, the study seeks to understand why wind energy remains underutilised during a period of growing energy demand and sustainability imperatives. The aim is to identify not only the structural challenges but also the underlying perceptions that shape the country's renewable energy trajectory.

### 1.3 Research Objective

Building on the recognition that both structural and sociotechnical factors influence the adoption of wind energy, this study aims to investigate the potential of wind power in Bangladesh by addressing its opportunities and challenges across multiple dimensions. The objectives therefore combine an examination of technical and institutional barriers with an exploration of social perceptions and collective imaginaries surrounding renewable energy transitions in the country.

Accordingly, the study seeks to understand how policy frameworks, infrastructural realities, and societal narratives intersect to shape wind energy adoption in

Bangladesh. It focuses not only on the technical feasibility and economic viability of wind projects but also on the cultural, institutional, and discursive factors that determine how such technologies are imagined and accepted. In doing so, the research aims to identify strategies that could bridge the gap between technocratic ambitions and public engagement, ultimately facilitating a more inclusive and sustainable energy transition.

## 1.4 Research Questions

To achieve these objectives, the study seeks to answer the following research questions:

Overall research question:

Why is wind energy in Bangladesh underutilised during the time of the energy crisis?

Sub-research questions:

- 1) What technical, institutional, and policy barriers constrain the large-scale adoption of wind energy projects in Bangladesh, and how do these barriers interact with infrastructural and material limitations?
- 2) How do societal perceptions, policy narratives, and technocratic visions shape the sociotechnical imaginaries of wind energy in Bangladesh, and to what extent do these imaginaries influence the acceptance and implementation of wind energy adaptation in Bangladesh?

## 1.5 Thesis Outline

The thesis is structured into six chapters. Chapter 1 introduces the research background, outlining global energy transitions, Bangladesh's energy challenges, and the potential of wind energy, alongside research objectives and questions. Chapter 2 reviews literature on renewable energy transitions, global wind energy trends, and barriers, grounded in the Sociotechnical Imaginary (STI) framework. Chapter 3 explains the qualitative methodology, detailing data collection through interviews, document analysis and thematic data analysis techniques. Chapter 4 presents findings on societal perceptions, technical, economic and other challenges

and prospects related to wind energy in Bangladesh. Chapter 5 Analyses and discusses the findings using the STI framework, emphasising the role of imagination and materiality in overcoming barriers. Finally, Chapter 6 summarises findings, provides the concluding remarks, and offers directions for future research.

## 2. Literature Review & Theoretical Approach

The transition to renewable energy systems has become an urgent priority worldwide, driven by the dual pressures of climate change and the depletion of fossil fuel reserves (Karlilar Pata & Balcilar, 2024). For instance, a small country like Bangladesh, where energy demand is rising, and natural gas, the primary fossil fuel source, is alarmingly depleting. Despite global commitments, the pathways to energy transition vary significantly across regions, shaped by political, economic, and social factors (Kappner et al. 2023). STI concept provides a valuable framework for understanding how collective visions, societal expectations, and systemic structures influence energy transitions. Existing literature offers insights into how the STI concept has been applied in different contexts to examine energy systems, but gaps remain, particularly in understanding the societal and stakeholder dimensions of wind energy adoption in emerging economies like Bangladesh. This review critically examines relevant studies, identifying contributions and gaps to frame the focus of this thesis on wind energy adoption in Bangladesh.

### 2.1 Defining Key Concepts and Theoretical Framework

#### **Energy**

Energy can be broadly defined as the capacity to do work, including various forms such as mechanical, thermal, chemical, and electrical energy (Smil, 2017). In the context of modern societies, energy is more than a physical quantity; it is a fundamental driver of economic development, social well-being, and technological progress (Sovacool, 2016). In the context of this study, the term refers primarily to the generation of electricity for national consumption, produced from sources including fossil fuels, renewables, and nuclear power. The quality, accessibility, and sustainability of this energy influence its role in the economic development and social well-being of Bangladesh.

## **Energy Transition**

Energy transition refers to the structural shift in the composition of energy systems from a reliance on fossil fuels to a more sustainable mix dominated by low-carbon or renewable sources (Geels et al., 2017). Such transitions involve not only technological change but also transformations in policies, institutions, markets, and cultural practices (Sovacool & Griffiths, 2020). While the term is often associated with global decarbonisation goals, in Bangladesh the energy transition is also linked to national priorities such as enhancing energy security, reducing import dependency, and meeting Sustainable Development Goals (SDG 7).

This thesis applies the concept of energy transition to analyse the slow uptake of wind energy in Bangladesh, recognising that transitions are socio-technical processes shaped by interlinked material, institutional, technological, economic and cultural factors. By clearly defining these terms, the analysis is anchored in a shared conceptual framework that connects the empirical findings to broader scholarly debates on sustainable energy futures.

## **Theoretical Framework: Sociotechnical Imaginaries (STI) and Materiality**

This research employs the concept of Sociotechnical Imaginaries (STI) (Jasanoff & Kim, 2009) to understand how collectively imagined futures shape, and are shaped by, technological choices and institutional structures. In Bangladesh's wind energy sector, different imaginaries can be observed. First, technocratic imaginaries, held by policymakers, engineers, and donors, prioritise national energy security, cost efficiency, and infrastructure modernisation. Second, social imaginaries, held by local communities and the broader public, tend to be weaker and shaped by familiarity with solar energy, dominant fossil fuel narratives, and limited exposure to wind technology. By comparing these imaginaries, the study examines whether they are aligned, misaligned, or in tension, and how such relationships influence the implementation of wind energy projects. In doing so, this thesis also highlights the potential and obstacles for large-scale wind projects in Bangladesh.

The concept of 'Materiality' complements the STI concept by focusing on the physical infrastructures; including roads, ports, transmission lines, and turbine



technologies, that both enable and constrain wind energy adoption (Kuchler & Bridge, 2018). Materiality recognises that these physical factors are not neutral; they actively influence public perceptions, policy priorities, and the practical feasibility of technological visions.

Together, these frameworks provide an integrated lens for understanding the social, institutional, and physical dimensions of Bangladesh's wind energy transition. They link directly to the study's research questions by shedding light on how imaginaries and material realities interact to shape barriers and opportunities for wind energy adoption.

## 2.2 Energy Transition in Global Contexts

The urgency of transitioning to renewable energy is a global imperative, driven by the dual crises of climate change and the depletion of fossil fuel reserves. The shift from carbon-intensive sources such as coal, oil, and natural gas toward renewable and low-carbon energy solutions like solar, wind, hydro, and bioenergy are increasingly viewed as essential for achieving environmental sustainability, long-term energy security, economic growth, and social equity (Smil, 2017). This transition is supported by international frameworks such as the Paris Agreement and Sustainable Development Goal 7, which calls for “affordable and clean energy for all” (IPCC, 2021).

However, the pace, scale, and direction of energy transitions vary widely across countries, shaped by political systems, economic priorities, historical dependencies, and public values. Developed nations have generally led the shift through large-scale investments in renewable infrastructure, coherent policy frameworks, and public support. Developed countries like Sweden and Denmark, for instance, have effectively phased out significant portions of their fossil fuel usage by expanding wind and hydro energy, aided by strong institutions and social consensus (Lund, 2024). The European Union has further supported this momentum through long-term decarbonisation policies under the European Green Deal (European Commission, 2020).

In contrast, fossil fuel dependency and other factors continue to dominate the energy strategies of many developing and hydrocarbon-rich nations. In countries

like Poland, historical reliance on coal and the prioritisation of energy security have slowed renewable integration despite EU climate goals (Rabiej-Sienicka et al., 2022). Similarly, in the Gulf Cooperation Council (GCC) countries, efforts to diversify energy portfolios are often challenged by the entrenched dominance of oil and gas in national economies, although initiatives for energy efficiency and renewable are emerging. In addition to technical and economic challenges, key barriers to renewable energy adoption in the GCC include high hydrocarbon subsidies, low electricity tariffs, fragmented policies, lack of regulatory frameworks, and a tightly controlled power market. (Al-Sarihi & Mansouri, 2022). In the United States, public perceptions of renewables are often influenced by local economic conditions and cultural identities such as those tied to coal or uranium-rich regions, demonstrating how social and economic factors can outweigh environmental considerations (Smith & Tidwell, 2016).

Emerging economies like China and India face unique challenges. While China leads globally in solar and wind production, it continues to rely heavily on coal to meet industrial demand (Zhao et al., 2022). India's renewable energy push, particularly in solar, is shaped by the need to balance economic growth, energy access, and affordability (Mazid, 2020). Elsewhere, countries in Latin America and Africa, such as Brazil and South Africa, show high renewable potential but struggle with governance gaps, investment risks, and unequal energy access (IRENA, 2021).

What unites these studies is a recognition that energy transitions are not merely technical shifts, but complex processes shaped by economic structures, public values, institutional capacities, and policy coherence. Achieving sustainable energy transitions, therefore, requires not only investments in technology but also inclusive planning, strong governance, and social engagement to overcome resistance and ensure equitable outcomes.

## 2.3 Bangladesh's Energy Transition: Potential & Challenges

Previous research on Bangladesh's energy landscape highlights both significant potential and challenges in achieving a successful transition toward renewable energy, particularly wind power. While technical studies have demonstrated

promising natural conditions for wind energy generation, a number of institutional, social, and economic barriers continue to hinder large-scale adoption. The literature suggests that although Bangladesh (Das et al., 2023) possesses substantial untapped wind energy potential, progress has been slow due to a fragmented policy framework and limited stakeholder engagement.

Several studies have identified promising opportunities for wind energy in Bangladesh. High-resolution mapping conducted by Islam et al. (2021) revealed that specific coastal areas such as “Charfashion” and “Monpura” possess annual average wind speeds of 7.3 m/s at 100 meters, suitable for utility-scale wind energy development.

Babu et al. (2022) further demonstrate that wind energy is economically viable, estimating generation costs at around BDT 6 per kWh, making it the country's second most affordable energy source after natural gas. These findings collectively reinforce the technical and economic feasibility of integrating wind power into the national energy mix. Additionally, Debnath et al. (2023) highlight the strategic value of wind energy in enhancing energy security amid concerns about fossil fuel supply disruptions and rising import dependence.

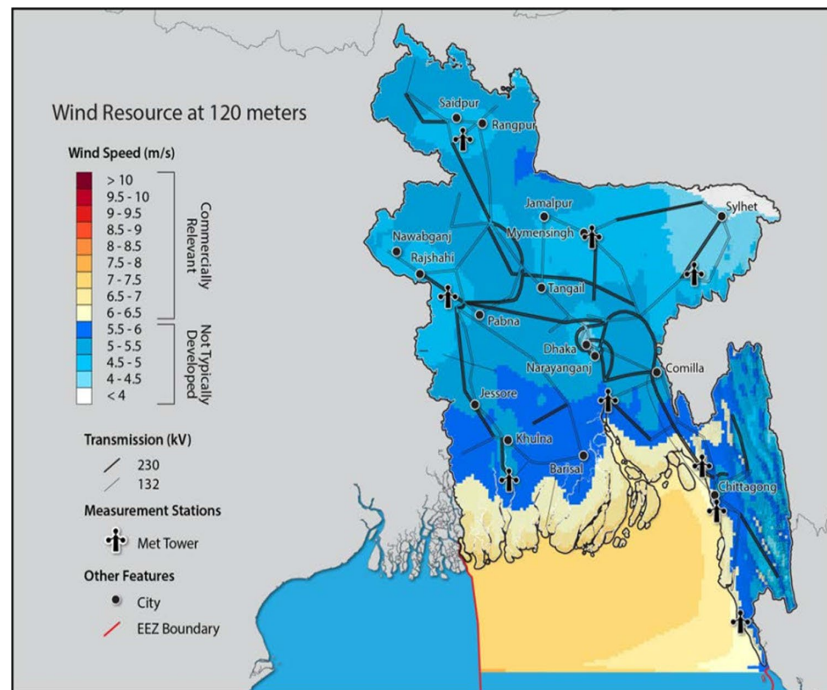


Figure 1. Wind Resource Map of Bangladesh at 120 Meters hight (Babu et.al 2022)

However, the realization of this potential is hampered by multiple challenges. Das et al. (2023) identify six categories of barriers: technical, administrative, policy and political, economic, social, and geographic. Technical challenges are ranked highest. These include technology risks, land-use conflicts, and inadequate data on wind resources. Despite promising technical findings, Bangladesh still lacks comprehensive site-specific wind measurements and infrastructure to support project deployment. Meanwhile, Babu et al. (2022) and Islam et al. (2021), while detailing wind resource potential, fall short of examining the socio-political context necessary for project success, such as stakeholder coordination and public acceptance.

Social and institutional barriers are another significant concern. Both Das et al. (2023) and Debnath et al. (2023) point out the limited involvement of local communities, policymakers, and private investors in wind energy planning and implementation. Stakeholder engagement and public perception remain underexplored areas in the academic discourse, yet they are critical to ensuring project sustainability. Furthermore, Debnath et al. (2023) note that broader socio-economic benefits of wind energy, such as employment generation and rural development, have not been sufficiently integrated into policy planning or research. This lack of attention to social dynamics reinforces the need for a more interdisciplinary approach that considers both technical feasibility and social acceptance.

In summary, while existing studies have successfully outlined the technical and economic potential of wind energy in Bangladesh, they collectively signal the need to address persistent institutional, policy, and social barriers. A more holistic and integrated research approach that accounts for stakeholder dynamics, regulatory coherence, and long-term socio-economic impacts is vital to unlocking wind energy's full potential in the country, in which this thesis will partly trying to unpack.

## 2.4 Theoretical approach

The purpose of this study is to explore the diverse, complex, and interrelated reasons why the use of wind energy in Bangladesh is still not at the desired level in

power generation. The STI concept provides a robust framework for understanding the complex interplay between societal perceptions, cultural values, and technological development (Rudek 2022). This concept describes the nonlinear, ambiguous, and uncertain processes of envisioning, promoting, and performing renewable energy futures in various contexts (Hudlet-Vazquez et.al 2023). Applying this theory to the research problem of the slow adoption of wind energy in Bangladesh allows for an in-depth exploration of the collective visions and cultural dimensions that shape the trajectory of energy choices. My theoretical framework is grounded in the STI concept, where I am specifically focusing on two perspectives, 1. Constructing the ‘imaginary’ as a positive force and 2. ‘Materiality’ to fulfil this purpose. Below, I will draw an overview of the STI concept, and then I will build on the concepts that I am specifically relating to with this thesis.

#### 2.4.1 Sociotechnical Imaginaries (STI)

STI have developed as an approach to understanding the relations between scientific and technological projects and political institutions and power (Chateau et.al, 2021). However, the idea of “Sociotechnical Imaginaries” was first introduced by Jasanoff and Kim (2009). They (2009) defined national sociotechnical imaginaries as “collectively imagined forms of social life and social order reflected in the design and fulfilment of nation-specific scientific and/or technological projects”. The concept of STI builds in part on the growing recognition that the capacity to imagine futures is a crucial constitutive element in social and political life. Imagination is no longer viewed as only imagination or illusion, but rather as a valuable cultural resource that, via projecting and pursuing positive ideals, enables the emergence of new forms of life. Furthermore, imagination is not just thought to exist in the form of aesthetic concerns within individual minds. Rather, imagination provides the gaze through which “the Other” is constructed and represented, it forms the foundation for a shared sense of belonging and attachment to a political community, it aids in the production of meaning systems that enable collective interpretations of social reality, and it directs the standardisation and simplification of human subjects in order to govern them more effectively (Jasanoff & Kim 2009:120). Appadurai (1996) briefly said, imagination, viewed as “an

organised field of social practices,” serves as a key ingredient in making social order.

It has long been an established principal of the histories of scientific and technical discovery that imagination in these specialized fields arises mostly in the imaginative imaginations of individual scientists and engineers. On the other hand, science and technology studies have shown that future possibilities, promises, and visions are ingrained in the social organisation and practices of science and technology. As a result, they shape and inform the trajectories of research and innovation (Jasanoff & Kim 2009).

It is important to emphasise, nevertheless, that these “technoscientific imaginaries” (Jasanoff & Kim 2009) are not the only means by which future possibilities are connected to science or technology. They are nearly always infused with implicit conceptions of what is desirable or good in the larger social context, for example, how science and technology may serve the demands of the public and even who the relevant publics are. Thus, in addition to being “technoscientific imaginaries,” they are also “social imaginaries,” embodying shared ideas about what constitutes a just society (Jasanoff and Kim 2009:122–123). Carvalho et al. (2022) explain how the concept of sociotechnical imaginaries went through different paradigm shifts and continues to be conflicted, expanded or redefined in its analytical scopes. Smith and Tidwell (2016) think that the literature on sociotechnical imaginaries initially concentrated on the role that state and international actors play in influencing ideas of a good society. The basic plans and procedures used in scientific research and technological development can be influenced by national imaginations. The politics that emerge from science and technology may influence not only the particular concerns surrounding those particular endeavours but also broader social and political conceptions of the past, present, and future of a country (Jasanoff and Kim 2009: 124).

From this point of view, the concept progressively shifted its attention to imaginaries that are produced by non-state actors, mainly the role of civil society, recognising that it allows sociotechnical imaginaries to analyse views that are diverse, decentralised and non-hegemonic in nature (Hess & Sovacool 2020). The analytical scope was later further expanded to capture the imaginaries of the local

communities, social movements, corporations and non-government organizations (NGO) (Chilvers & Longhurst 2016). Turney (2013) expanded this idea based on two findings. One is that our technological societies have become increasingly aware of the ways in which we tell stories about future technologies. The second is that there are already scattered attempts to employ storytelling more directly as a tool for brainstorming new technology possibilities or even as a direct contribution to development. In recent years, the scope of the STI field has expanded, with a growing focus on the plurality of energy futures and the diversity of actors, stories, discourses, imaginings and practices at different scales that might shape their imagining and realisation (Chateau et.al 2021).

Therefore, Jasanoff (2018) redefined the concept as “collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology.” In the context of this thesis, the concept of sociotechnical imaginaries is used to analyse how collective visions, both technocratic and social, shape Bangladesh’s wind energy transition. It provides a framework to interpret how institutional ambitions, policy discourses, and public perceptions interact to influence the country’s capacity to adopt and normalise wind power as part of its sustainable energy future.

The lens of ‘sociotechnic imaginaries’ can also be used to map the resistance to implementing energy transitions amongst different national and social units by analysing the shared imaginaries linked to existing national policies, scientific and lay knowledge (Rabiej et.al 2022). Carvalho et.al (2022) used ‘sociotechnical imaginaries’ approach to identify different conflicting visions of technological development, to analyse different type of production, mobilisation and justifications of imaginaries by different stakeholders as well as the process of the co-production between different stakeholders such as the state, corporations, NGOs, social movements and the citizens of the state.

#### 2.4.2 Constructing the imaginary as a positive force

STI emphasizes the entanglement of the materiality of sociotechnical projects with the normative aspects of collective imagination. This means that the development

and implementation of complex sociotechnical systems are not just technical endeavours; they are deeply embedded in societal visions and aspirations. In support of this expression, Beck et al. (2021) states that the STI idea highlights the interplay between the materiality of intricate sociotechnical undertakings and the normative elements of collective imaginations of states of society (Beck et al. 2021). It considers environmental transformation, for instance, not just as modifications to human uses of nature (agricultural, industrial, exploitative, etc.) but also acknowledges that ideas of progress associated with it (such as “transformation” in accordance with definitions of previously less desirable states or notionally desirable future states). There are typically many more salient dimensions to the phenomena in play than can be explicitly attended to in informal analysis in the non-interpretive social sciences. It is with attention to these subjective as well as objective considerations that STI brings together work on the role of collective imagination with work on technoscientific development (Beck et al. 2021).

Froese and Mevissen (2020) addressed these issues in their work and linked the concept of participation and group development to imaginaries. While imaginaries that address underlying social and political complexities are required for the implementation of new technologies, scholars have paid little attention to the interaction between imaginaries and group development, as well as how different forms and interpretations of participation may evolve during knowledge co-creation by diverse groups (Moore 2013). The focus here is on the groups because, as problems become more complicated, groups become increasingly important. Combining the various knowledge of diverse groups is critical to finding answers to multifaceted major concerns like climate change (Gibbons et.al 1994). According to research, interdisciplinary groups have a high potential for producing novel discoveries and radical innovation (Hackett & Parker 2016). Science policy is increasingly supportive of such settings; yet there are numerous conditions for trans and multidisciplinary settings to be successful (Donina et al. 2017).

Sociotechnical imaginaries are distinct from narratives and discourses in the long-standing Foucauldian tradition in that the former emphasise purpose, action,



and aspiration through the materialisation of technology, while the latter typically concentrate on language, ideas, and social practices (Beck et al. 2021). STI do not solely concentrate on the technical viability of achieving global paths to technological endpoints like a low-carbon future. More complex relationships arise, for instance, in how risks are framed collectively, their nature both short and long-term and how they affect vulnerability and resilience. They also arise when it comes to who is responsible for and owns the risks and benefits associated with different technological paths that lead to sustainable futures (Beck et al. 2021:145).

Kuchler (2014) addressed these issues in her work through analysing the sociotechnical imaginaries of second-generation bioenergy in the global debate. When it comes to the issues of sustainable future, the STI can also be scrutinised by utilising a critical and diagnostic method to understand whether the projected visions of the imaginaries actually entail the promises of radical changes as well as the hope for a socioeconomic transition towards a green future or is actually manifesting an ideological stronghold that is striving to perpetuate the status quo (Kuchler, 2014)).

Alf Hornberg (2014) expanded on the bioenergy debate by pointing out that "a successful technical experiment does not provide sufficient evidence that a new technological system is 'feasible' or 'within reach', nonetheless, such conclusions are very frequently drawn in both academic and public debates." Benediktsson (2021) thinks that there are many existing alignments and mismatches between the sociotechnical imaginaries focusing on different aspects of technology and society. The analysis of these alignments and mismatches can partly explain why energy transitions in different countries and regions take different courses throughout the journey.

From the above-mentioned literatures, it can be summarized that sociotechnical imaginaries take shape through iterative co-production between state agencies, experts, market actors and publics, and are then stabilized via policies, infrastructures and repeated public performances (Jasanoff & Kim, 2009). They are narrated and normalized through planning documents, funding rules, media framings and demonstrator projects, which together define what counts as "plausible" and "desirable" futures (Hess & Sovacool, 2020). These imaginaries

can be contested or diversified by civil society forums and participatory spaces, but their adoption is contingent upon institutional receptivity and alignment with material factors like grid capacity and siting possibilities (Kuchler & Bridge, 2018). In short, imaginaries are constructed as much by documents and devices as by discourse, through the combining of storylines, standards and material elements. For Bangladesh, this implies examining the interplay between national plans (e.g., Power System Master Plan, 8th Five Year Plan), donor programs, media narratives and early projects as the key platforms where wind energy futures are being imagined and made. These mechanisms guide my analysis in Chapter 4 and 5.

### 2.4.3 Materialities

In social science research, the term "materialities" refers to the distinction that objects and other non-human phenomena make in social life and the establishment of social order. The word designates a form of explanation in which a wider range of symmetrically distributed capacities (agency, affect, and enrollment) are allocated to both human and non-human actors, which are normally designated for human actors (Kuchler & Bridge 2018). The study of materiality draws on a variety of conceptual traditions. These range from post-structural accounts, such as assemblage theory or vital materialism, which emphasise the ability of inanimate objects to assert their presence and have an impact on the world, to work at the intersection of political economy and ecological economics that emphasises the temporality and variability of biophysical processes (Bennett, 2020).

More practically, though often in dialogue with these more general conceptual issues, socio-technical research on energy infrastructures employs the term "materiality" to refer to the various, usually insignificant devices (switches, pipes, display units, etc.) that make up energy systems. Kuchler and Bridge (2018) point out that the focus on materiality in this context aims to underscore how these devices enable, determine or constrain various social practices within power systems. Researchers acknowledge the disruptive capacity of materiality in social organisation and its potential to generate alternative outcomes. Concepts like 'turbulence' and 'excess' highlight how non-human phenomena can interrupt social organisation and challenge traditional social science analyses that treat objects and

materials as passive participants (Kuchler & Bridge 2018). Researchers also explore the instability and ambiguity of materials and objects, suggesting that their properties and meanings are not fixed but emerge and change over space and time. Such an example is the demonstration of how the process of “informational enrichment” surrounding materials is driven by the scientific and legal practices of inspection related to resource development. The reason for instability is that materials and objects could be constituted in new manners, either by using new scientific or valuation methods, or by being enrolled in various knowledge constituencies via the networks that facilitate the flow of information. Recent anthropological work on resource materialities emphasizes a relational and distributed perspective, where resources are viewed as always in flux and open-ended. The concept of 'affordances' becomes crucial in understanding the socio-political possibilities offered by different environments and materials, highlighting how resources can be made to do certain things and how they are known, circulated, and engaged with in social contexts (Kuchler & Bridge 2018: 138).

To construct "imaginary" as a positive force, I want to emphasize later in my analysis how sociotechnical imaginaries, through their multidimensional and purposeful nature, contribute to envisioning and pursuing transformative societal goals. They serve as a driving force for innovation, societal progress, and the pursuit of sustainable futures. The emphasis on materialisation through technology highlights the tangible and actionable aspects of these imaginaries, turning them into positive forces that shape and guide societal development. Also, the purpose of highlighting the different materialities of wind in this thesis is to show that socio-technical imaginaries do not only act as a positive force for sustainable energy transitions but also introduce existing and potential barriers (e.g., infrastructure, port facility, grid capacity, site-specific data etc.).

## 2.5 Key Gaps and Opportunities in Wind Energy Research

The reviewed literatures highlight the growing use of the STI concept to analyse energy transitions. Rabiej-Sienicka et al. (2022) and Loy (2023) effectively apply

the concept to understand how shared imaginaries shape energy policies and systems in Poland and Sweden, respectively. However, these studies focus on specific national contexts, offering limited insights into how the STI concept can be applied to developing countries like Bangladesh. Smith and Tidwell (2016) expand the application of STI by integrating it with resource materiality, providing a more nuanced understanding of how socio-economic conditions influence energy imaginaries. This approach could be valuable for exploring the adaptation of wind energy in Bangladesh, where socio-economic and cultural factors play a significant role in shaping public perceptions and policy decisions.

While the existing literatures provide valuable insights into the technical, economic, and sociotechnical aspects of wind energy adoption, several gaps remain. First, there is a limited examination of stakeholder perceptions in Bangladesh, including the roles of local communities, policymakers, and private investors. Understanding these perspectives is critical for ensuring the sustainable implementation of wind energy projects. Second, the socioeconomic impacts of wind energy adoption, such as job creation, rural development, and energy access improvements, are insufficiently explored. These dimensions are vital for aligning wind energy projects with national development goals and local needs.

Furthermore, most studies on Bangladesh focus on technical and economic feasibility, with limited attention to institutional and policy-related barriers. Comparative analyses that incorporate lessons from other emerging economies could provide valuable insights into overcoming these challenges. Finally, while the STI concept has been applied effectively in global studies, its application to Bangladesh's energy transition remains limited. This gap presents an opportunity to leverage the STI concept to examine how shared imaginaries influence the adoption of wind energy in Bangladesh, particularly in the context of stakeholder perceptions and systemic barriers.

The literatures reveal the multifaceted challenges and opportunities associated with wind energy adoption, particularly in emerging economies like Bangladesh. While technical and economic aspects have been explored extensively, sociological and stakeholder-driven perspectives remain underrepresented. This thesis addresses

these gaps by applying the STI framework to examine the barriers and opportunities for wind energy adoption in Bangladesh, focusing on the interplay of societal perceptions, institutional dynamics, and technical feasibility. By integrating technical, social, and policy dimensions, this research aims to contribute to a more comprehensive understanding of the potential and challenges of wind energy in Bangladesh.

## 3. Methodology

### 3.1 Research Approach

A qualitative research method was chosen for this study as it is particularly effective for exploring complex phenomena, such as societal perceptions, diverse challenges and barriers to wind energy adoption in Bangladesh. Qualitative research enables an in-depth understanding of human experiences, behaviours, and interactions within specific social and cultural contexts (Creswell & Creswell, 2018). Unlike quantitative methods, qualitative research focuses on interpretation and meaning, making it suitable for analysing narratives, interviews, and textual data (Merriam & Tisdell, 2016). This approach aligns with the study's objectives, as it allows for a nuanced exploration of stakeholders' perceptions and the systemic factors influencing wind energy implementation.

Furthermore, qualitative research provides the flexibility to gather rich, descriptive data through interviews and document analysis, enabling the identification of emerging patterns and themes (Patton, 2015). It is particularly useful for studies using theoretical frameworks, such as the STI concept, which requires an interpretive approach to understand how societal visions and collective perceptions shape energy transitions. This study's use of qualitative methodology allows it to better understand the opportunities and problems facing wind energy in Bangladesh by considering the opinions of important stakeholders. To achieve the research objectives and answer the research questions, the study relies on two primary data collection methods: secondary data analysis and semi-structured interviews with key stakeholders.

### 3.2 Data Collection Methods and Process

This study employed a combination of secondary data analysis and semi-structured interviews to gather relevant information about the challenges and opportunities for wind energy adoption in Bangladesh. By utilising both qualitative approaches, the study ensured a comprehensive understanding of the topic from policy, technical, and societal perspectives.

### 3.2.1 Secondary Data Collection and Analysis

Secondary data analysis was conducted to review policy documents, government reports, technical studies, and academic literature. The purpose of this analysis was to understand the prospects and challenges associated with wind energy in Bangladesh. A list of key documents that are used mostly has been given below in Table 1. All the bibliographies have been added to the references.

Key sources for secondary data included:

1) Government Documents: Long-term and short-term energy plans, renewable energy policies, and status reports on ongoing and proposed wind energy projects were reviewed. Agencies such as the Sustainable and Renewable Energy Development Authority (SREDA), Bangladesh Power Development Board (BPDB), and the Ministry of Power, the Ministry of Environment, Forest and Climate Change provided valuable insights. Key documents from the Bangladesh Planning Commission, Ministry of Power, Energy and Mineral Resources were accessed through their respective repositories and websites. Searches were conducted using keywords such as “wind energy,” “renewable energy,” and “Bangladesh.”

2) Academic Literature: Peer-reviewed articles, technical papers, and studies on renewable and wind energy in Bangladesh were reviewed. These sources provided detailed insights into technical feasibility, socio-economic potential, and barriers related to wind energy projects. I have taken the help of the SLU library online, Google Scholar, and other credible websites as a secondary source for Peer-reviewed articles and technical papers.

3) Reports and White Papers by Donor Agencies: International organizations like USAID provided valuable comparative insights into renewable energy implementation strategies in Bangladesh. Specifically, the study utilized four white papers from USAID's Scaling Up Renewable Energy (SURE) project and reports from the National Renewable Energy Laboratory (NREL). These materials provided critical information on integrated resource planning, renewable energy procurement strategies, and advanced wind resource assessments, including hub-height wind data. A list of secondary documents is given below.

*Table 1 Secondary Documents list*

<b>Documents</b>	<b>Accessibility Guidance</b>
8th Five-Year Plan (2021–2025)	8th Five-Year Plan (2021–2025): Access the GED portal at <a href="https://plancomm.gov.bd/">https://plancomm.gov.bd/</a> , navigate to the "Publications" section, and search for the "8th Five-Year Plan."
Power System Master Plan 2016 (2016) and Revisiting Power System Master Plan 2016 (2018)	Power System Master Plan 2016 (PSMP 2016): Visit the Ministry of Power, Energy and Mineral Resources' website at <a href="https://emrd.gov.bd/">https://emrd.gov.bd/</a> , Go to the "Reports" or "Energy Policy" sections.
Wind Resource Mapping for Bangladesh	National Renewable Energy Laboratory (NREL), 2018. Wind Resource Mapping for Bangladesh. Golden, CO: NREL. Available at: <a href="https://www.nrel.gov/">https://www.nrel.gov/</a>
Scaling Up Renewable Energy (SURE) White Papers	USAID SURE Reports: All USAID publications can be accessed via their main portal. Visit <a href="https://www.usaid.gov/">https://www.usaid.gov/</a> , search for "Scaling Up Renewable Energy (SURE) Bangladesh" in the search bar to retrieve all listed reports.

### 3.2.2 Semi-Structured Interviews

"Semi-structured interviews are an effective method for obtaining in-depth insights into participants' perspectives while allowing for flexibility to explore emerging themes, making them ideal for complex topics like wind energy adoption (DiCicco-



Bloom & Crabtree, 2006). Moreover, this approach ensures that the researcher can adapt questions dynamically to address specific contextual nuances while maintaining a consistent framework across interviews (Bell et al., 2019). For this study, Semi-structured interviews were conducted to capture first-hand perspectives from a diverse range of stakeholders directly or indirectly involved in Bangladesh's wind energy sector. A total of eight in-depth interviews were carried out with government high officials, academics, industry representatives, technical experts, civil society representatives and journalists.



*Figure 2. Process Design for Conducting Semi-Structured Interviews (Own illustration)*

### 3.2.3 Participant Identification & Interview Process

Identifying suitable participants required considerable effort due to the limited expertise in Bangladesh's nascent wind energy sector. A systematic process was used, beginning with a broad list of potential interviewees, which was narrowed down based on relevance to wind energy and renewable energy policy. Participants were contacted via email and phone, provided with an overview of the study, and invited to participate.

Interviews were conducted in Bengali, either in person or via Zoom, depending on participant preferences. All interviews were recorded with prior consent, transcribed, and translated into English by the author for analysis. A detailed

interview guide was prepared to align questions with the study's objectives. To ensure confidentiality, all personal identifiers were anonymized, and participants' identities were coded. However, a list of participants will be provided at the end of this paragraph. Detailed descriptions of their occupation have been omitted from the list to protect their identities. When these interviewees are cited later in this thesis, they will be referred to by the interviewee number in the table below.

*Table 2 Interviewee Description*

No.	Occupational Description	Expertise/Role
1.	Professor Emeritus (former vice chancellor of a private university)	Water resource Management and climate change expert
2.	High Official (Bangladesh Power Development Board, Government Agency, Renewable Energy) (Energy Section)	Renewable energy policies and implementation
3.	High Official (Power Cell, Government Agency, Renewable Energy Section)	Renewable energy policies and implementation
4.	Former Representative (Sustainable and Renewable Energy Development Authority)	Wind energy, renewable energy development
5.	Senior Research Fellow (Bangladesh Institute of International and Strategic Studies) (BISS)	Strategic energy and policy research
6.	Senior Reporter (Nationally Recognised TV Channel)	Media coverage on energy and environmental issues
7.	Engineer (Energy project development and skill development)	Private sector, Industry representative
8.	Representative of non-government Organization (NGO)	Working in Energy sector, Civil society representative

Both secondary data and interview responses were analysed thematically to identify recurring patterns and themes. This dual approach allowed the study to cross-validate findings, ensuring a holistic and credible analysis of wind energy adoption in Bangladesh.

### 3.3 Data Analysis

Thematic analysis was chosen for this study due to its flexibility and effectiveness in identifying, analysing, and interpreting patterns or themes within qualitative data (Braun & Clarke, 2006). This method is particularly suitable for exploring complex issues, such as the societal and institutional barriers to wind energy adoption in Bangladesh, as it allows for the extraction of recurring themes from both interview data and secondary sources. Thematic analysis is not restricted to any specific theoretical framework, making it adaptable to the STI approach used in this study. Furthermore, it provides a systematic yet inductive process to derive insights directly from the data, enabling a deeper understanding of the participants' perceptions and experiences while maintaining a clear link to the research objectives (Nowell et al., 2017). This approach ensures that the analysis remains grounded in the data while uncovering meaningful themes that address the research questions effectively.

The process began with familiarization, involving repeated reading of the transcripts and secondary documents to gain a comprehensive understanding of the content. This was followed by coding, where specific segments of the data were categorised based on their relevance to societal perceptions, technical challenges, policy barriers, opportunities etc. These codes were then grouped to identify key themes, such as policy gaps, public awareness, technical feasibility etc. By connecting the emerging themes to the research objectives, a clear and transparent link was established between the data and the study's goals. Finally, the identified themes were interpreted within the STI framework to explore how societal perceptions and collective visions shape wind energy adoption in Bangladesh. This process not only ensured an organised approach to data analysis but also facilitated the identification of new concepts and key findings.

### 3.3.1 Integration of Theory in to the Coding Process

Although the initial coding process followed an inductive approach, the theoretical framework, particularly Sociotechnical Imaginaries (STI) and Materiality, directly influenced how the codes were organised, refined, and interpreted. Data segments that reflected interviewees' visions, expectations, and narratives about Bangladesh's energy future were coded through the lens of STI, distinguishing between technocratic imaginaries (policy-driven, expert-based visions) and social imaginaries (public perceptions, familiarity, and scepticism). Similarly, content related to physical infrastructures, resource measurements, logistical obstacles, and grid limitations was grouped under codes shaped by the concept of materiality. Using these theoretical concepts as analytical lenses allowed the themes to move beyond description and provided a structured, theoretically grounded explanation of how imaginaries and material conditions interact to shape wind energy adoption in Bangladesh. This demonstrates that the theoretical framework actively guided the coding and analytical process rather than functioning solely as a literature review.

## 3.4 Ethical Considerations

Including an Ethical Considerations section is essential to ensure that the study adheres to principles of integrity, respect, and accountability, safeguarding participants' rights and maintaining trustworthiness in the research process (Creswell & Creswell, 2018). This section demonstrates the researcher's commitment to ethical standards, such as informed consent, confidentiality, and cultural sensitivity, which are critical for ensuring validity and credibility in qualitative research (Merriam & Tisdell, 2016).

This study adhered to ethical research practices to ensure the integrity and safety of all participants. Informed consent was obtained, with participants being fully informed about the purpose of the study, their rights, and the voluntary nature of their participation. To maintain confidentiality, all interviewees' identities were anonymised, and the collected data were securely stored to prevent unauthorised access. Additionally, cultural sensitivity was prioritized by conducting interviews in Bengali, the participants' native language, which not only respected their

linguistic and cultural contexts but also ensured effective communication. As Bengali is also my mother tongue, the use of this language facilitated a more understandable, spontaneous, and natural flow of conversation, making the interviews easier to carry out and enabling participants to express their views more comfortably and openly. These measures ensured that the research was conducted ethically and respectfully, fostering trust and transparency throughout the process.

## 4. Findings

This chapter presents the findings from interviews with eight key stakeholders and the analysis of secondary data, including government policy documents, reports, and white papers. This chapter examines the key themes that emerged from the study, focusing on societal perceptions, technical, policy-related, economic challenges, and opportunities for wind energy adoption in Bangladesh.

### 4.1 Societal Perceptions and Public Awareness of Wind Energy in Bangladesh

#### 4.1.1 Cultural and Educational Gaps in Wind Energy Awareness and Acceptance

While studying this thesis, it became evident to me that there is a significant gap in policy documents and academic research addressing the cultural and societal views on harnessing wind energy or the establishment of large-scale wind farms in Bangladesh. Although renewable energy is discussed in detail in almost all policy documents, there is a minimal description and discussion of wind energy specifically. Also, there is limited exploration of how such projects might affect the mental health, perceptions, and well-being of local communities, or how these communities could benefit from or potentially be harmed by these developments. While many studies emphasize the importance of addressing these social and cultural aspects, they remain largely under-researched in the Bangladeshi context. For instance, issues like community resistance due to aesthetic impacts, fears of displacement, or concerns about noise pollution and environmental harm are acknowledged in global studies but seldom studied comprehensively in Bangladesh (Devine-Wright, 2009).

Talut (2024) stretches this argument by saying that the societal understanding of wind energy in Bangladesh remains limited, reflecting the dominance of conventional energy narratives and a historical focus on fossil fuels and other renewable energy sources like solar. Despite an increasing focus on renewable

energy in policy documents such as the Eighth Five-Year Plan (GED, 2020) and Power System Master Plan (PSMP) 2016, wind energy remains a peripheral priority compared to other energy sources like solar or coal-based power generation. For example, in PSMP 2016, there is about 10 pages of discussion on solar power, which includes specific targets and implementation strategies, while wind power is discussed in general terms in only 2 pages, without specific targets or project outlines. Similarly, the Eighth Five Year Plan gives extensive attention to coal and LNG as transitional fuels, while wind power is briefly mentioned, but without any policy support. This lack of focus on wind energy within these key strategic frameworks reflects the broader societal perceptions that prioritize energy security through conventional energy resources. The Nationally Determined Contributions (NDCs) report (MoEFCC, 2021) also emphasizes renewable energy's role in meeting sustainability targets but does not offer detailed implementation strategies for wind energy. Media and public discussions largely revolve around the expansion of fossil fuels and other renewable energy sources, leaving wind energy underrepresented. Reports from Scaling Up Renewable Energy (SURE) project (USAID, 2021) indicate that wind energy's benefits, such as its potential for energy security and environmental sustainability, are rarely discussed in public forums or news outlets. This limited awareness can be attributed to the lack of tangible success stories and widespread awareness campaigns about the potential benefits of wind energy. One journalist highlighted this gap in the interview, saying that:

The general public has not yet witnessed or benefited from any large-scale wind project. When the use of renewable energy is discussed on various platforms, in most cases, wind energy is discussed after solar, biogas, etc. As a result, the public's knowledge and awareness regarding this is not increasing. Success stories in renewable energy, such as solar home systems in rural areas, have led to a cultural preference for solar over wind energy. Therefore, people either see it as a distant option or are sceptical about the viability of wind energy. (Interview 6, 10/07/2023).

The above arguments address the overlooked societal and cultural dimensions of wind energy adoption in Bangladesh.

Education plays an equally critical role in shaping public perceptions, as awareness and technical knowledge about renewable energy directly influence public acceptance and policymaking (Devine-Wright, 2007). The lack of robust educational infrastructure and research initiatives in renewable energy, particularly wind energy, represents a significant barrier to its adoption in Bangladesh. Despite the global emphasis on developing renewable energy expertise, Bangladesh lags in fostering technical knowledge and leadership in this field. The absence of dedicated programs in universities, limited research grants and scholarships, and inadequate institutional support have restricted the country's capacity to innovate or adapt advanced technologies. In the interview, an academic described that:

From my personal experience, I have seen that one professor has secured a £5 million grant from the UK government for wind energy research; such opportunities are unimaginable in Bangladesh. Technology transfer from developed countries is crucial, but we often end up with older, outdated technology due to cost barriers, limiting our ability to innovate locally. It's not fair to blame only Bangladesh for lagging behind in wind energy; the reality is that resource limitations and global inequalities in technology access play a big role. (Interview 1, 09/10/2023).

As highlighted in interviews, grants and scholarships for research and development on wind energy in Bangladesh are negligible compared to developed nations, where substantial funding facilitates cutting-edge advancements. This disparity not only limits local innovation but also compels the country to rely on older, less efficient technologies from international markets. This gap in educational outreach also limits the development of local expertise and leadership, as well as contributes to a general lack of awareness among policymakers and the public. Addressing these gaps requires strategic investment in education and research, collaboration with international institutions, and curriculum development focusing on renewable energy. Without a skilled workforce and research-oriented mindset, societal scepticism toward wind energy and its potential benefits will persist, further delaying its integration into the energy mix.



#### 4.1.2 Policy-Level Awareness and Public Perceptions: Challenges in Prioritising Wind Energy

Although policy-level awareness is growing, it is still not sufficient to establish an actionable roadmap or clear priorities for wind energy. Government officials acknowledged that although agencies like the Bangladesh Power Development Board (BPDB) and the Sustainable and Renewable Energy Development Authority (SREDA) are committed to promoting wind energy, there is no unified roadmap or concrete policy framework that prioritises its adoption. Furthermore, the lack of success in early pilot projects has contributed to the perception that wind energy is unreliable or impractical for large-scale electricity generation in Bangladesh. According to the Revisiting PSMP (2018) report, pilot projects often suffered from inadequate wind resource assessments and technical inefficiencies, leading to their closure or prolonged downtime. These failures have dampened enthusiasm for wind energy among both policymakers and the public. A former representative from SREDA said:

“We have gained knowledge from pilot projects, but wind energy is still seen as experimental rather than a priority. Increasing institutional capacity between government and private institutions and coordination between government agencies will attract more domestic and foreign investors and speed up their work. And I believe, one successful major project could be a game changer in this area”  
(Interview 4, 17/05/2023)

The white paper from the SURE project (USAID, 2021) further highlights that Bangladesh's renewable energy focus has primarily centered on solar energy due to its lower perceived risks and implementation complexity. Wind energy, by contrast, is viewed as a more uncertain option, partly because of insufficient wind resource mapping and inadequate public awareness of its potential benefits.

From the above discussion, it can be said that the lack of a unified roadmap and actionable policy framework specifically for wind energy in Bangladesh, compounded with early pilot project failures, has significantly hindered its acceptance and prioritisation. Institutional gaps, such as insufficient coordination

among agencies and inadequate wind resource data, exacerbate public scepticism and investor reluctance.

## 4.2 Challenges to Wind Energy Development in Bangladesh

### 4.2.1 Technical Obstacles

Bangladesh faces considerable technical challenges in the adoption of wind energy (Das et al., 2023), particularly due to the lack of reliable, site-specific wind data. Although the National Renewable Energy Laboratory (NREL) conducted wind mapping in 2018, this data only provides a general overview and does not meet the requirements for commercial wind energy projects. Stakeholders emphasized that investors typically require at least two years of site-specific wind measurements to accurately assess the feasibility and financial risks of wind projects. Several interviewees significantly mentioned this data insufficiency issue. I am giving one industry representative's remark here. He said that,

Solar has a more persistent value of the data compared to wind. It varies a lot. Therefore, data from different parts of the day, for example, morning or afternoon and season-wise data are required. More Survey is needed in this regard. At least two years of site-specific data are required. We have data from NREL, which provides a general map, but we need granular, site-specific measurements to mitigate financial risks. National Renewable Energy Laboratory (NREL) data is not enough for investors. (Interview 7, 05/10/2023)

This sentiment reflects a common concern among investors about the reliability of existing data for large-scale investment decisions.

Besides these, infrastructure limitations further exacerbate technical challenges. Transportation of large wind turbine components, particularly to remote or coastal areas, remains a significant logistical challenge due to inadequate road and port facilities (Das et al., 2023). For example, the transportation of turbine blades and towers to potential wind sites, such as Cox's Bazar and Feni, requires upgraded infrastructure, including specialized transport routes and equipment. Grid

compatibility issues also pose a substantial barrier, as integrating variable renewable energy sources like wind into Bangladesh's existing power grid requires significant upgrades to grid infrastructure. Due to the highly erratic nature of solar and wind power availability in Bangladesh, additional storage systems are also needed to ensure a consistent flow to the grid and users (Talut, 2024). According to the SURE report (USAID, 2021), grid improvements, including better forecasting tools and smart grid technologies, are essential for managing the intermittency of wind power and ensuring grid stability. Bangladesh is still lagging in this regard. Environmental factors further complicate wind energy adoption. Interviewees, including government officials and technical experts, noted that sudden storms and cyclones during monsoon seasons present challenges for turbine durability and efficiency.

#### 4.2.2 Policy Gaps and Institutional Hurdles

Policy and regulatory barriers continue to hinder the development of wind energy in Bangladesh. While the government is motivated, it still lacks local expertise and large-scale project experience in wind energy, which hinders policymakers' ability to analyze and implement effectively. Despite the inclusion of renewable energy targets in national strategies such as the 8th Five-Year Plan and the Perspective Plan 2021-2041 (GED, 2021), there is no dedicated or cohesive policy framework, particularly for wind energy. Interviewees frequently highlighted this gap, with one government official stating that,

While there is general support for renewable energy, wind energy projects often struggle due to fragmented policies and coordination gaps between regulatory bodies. Yes, of course, the government is very much open and motivated in this matter. We are already working on how to do the big projects. We have more knowledge of solar energy than wind. Honestly, we have lack of local knowledge about wind energy and wind expertise for Bangladesh. Also, we have no large-scale wind plant yet. Therefore, we have not gained enough knowledge and cannot analyze things. (Interview 3, 07/05/2023)

Another major challenge is the lack of specific regulations to address land acquisition for wind projects. This issue significantly increases costs and delays project timelines, as land acquisition in densely populated Bangladesh is often complicated and expensive. Several interviews, such as NGO workers, Government officials, and private sector industry representatives, mentioned this barrier. One interviewee explained,

“Compared to Bangladesh, larger countries with less land scarcity have lower land use costs. Land acquisition for wind farms in Bangladesh is more complex and costly than that in other countries, which increases the cost per unit of electricity” (Interview 7, 05/10/2023)

The absence of clear guidelines for land use and zoning for wind energy projects creates uncertainty for investors, further deterring private sector participation.

The USAID white paper (2020) highlights significant institutional constraints that impede progress in the wind energy sector in Bangladesh. Limited institutional capacity within both public and private organizations, combined with a lack of experience in acquiring renewable energy generation capacity, creates multiple complications. For instance, the implementation of large-scale projects requires more than 40 permits and clearances from various departments, with approval processes often taking an extended period. SREDA, the agency tasked with promoting renewable energy development, suffers from inadequate resources and technical expertise, which limits its ability to effectively support large-scale wind projects. Interviewees identified a critical leadership gap within both the government and private sectors, particularly in the wind energy domain. SREDA itself faces structural challenges, including insufficient manpower and a lack of fixed positions dedicated to wind energy. One respondent emphasised,

“SREDA needs structural reform with more fixed job positions and better resource allocation to address wind energy projects effectively” (Interview 5, 08/05/2023)

The Revisiting PSMP (2018) report supports this point by mentioning that institutional inefficiencies and regulatory fragmentation remain critical barriers to achieving wind energy targets. These overlapping challenges underline the urgent need for coordinated reforms to smooth processes and enhance institutional effectiveness.

While environmental concerns such as potential impacts on biodiversity were raised in interviews, these were generally viewed as manageable through proper site selection and regulatory oversight. However, the lack of formal environmental guidelines for wind projects further underscores the need for a comprehensive policy framework (USAID, 2021).

#### 4.2.3 Economic and Investment Constraints

The economic viability of wind energy in Bangladesh presents significant challenges, especially when compared to other renewable and conventional energy sources. Stakeholders repeatedly emphasized the high initial capital investment required for wind energy projects, coupled with financial risks that discourage both domestic and foreign investors (Das et al. 2023). As highlighted in interviews, many investors are reluctant to rely solely on the NREL data for site assessments and prefer their own two-year, location-specific wind measurements. This extended data collection period increases upfront costs, adding to the financial burden of project development. Moreover, the absence of attractive financial incentives or subsidies specifically targeting wind energy exacerbates the issue. Unlike solar energy, which has benefited from considerable government and donor support, wind energy remains underfunded in strategic plans like the Perspective Plan 2021–2041 (GED, 2021) and the PSMP (2016). The lack of accessible and cost-effective financing mechanisms has led to slow progress in project development, particularly for offshore wind, which requires even larger investments due to logistical and infrastructural complexities.

Industry representatives and government officials also highlighted logistical hurdles, such as the transportation of large turbine components, as factors that drive up the per-unit cost of electricity generation, making wind energy less competitive compared to fossil fuels. According to an NGO worker, land acquisition further complicates economic viability, as high population density and limited availability

of suitable sites result in higher costs for securing land for wind farms (Interview 8, 2023).

## 4.3 Prospects of Wind Energy in Bangladesh

### 4.3.1 Emerging Opportunities

Despite the numerous challenges, stakeholders expressed optimism about the prospects of wind energy in Bangladesh, particularly given the growing interest in offshore wind projects. Ongoing feasibility studies by the Asian Development Bank (ADB) and private sector players aim to identify promising sites for offshore wind farms. According to one interviewee, the success of these studies could mark a turning point for wind energy adoption, as offshore projects offer higher wind speeds and reduced land acquisition challenges. Offshore wind also aligns with global trends, as highlighted in the USAID SURE report (2021), which identifies offshore wind as a critical area of growth for renewable energy in developing countries.

The decreasing cost of wind energy technology is another positive development. Globally, wind energy has become increasingly competitive, with some projects achieving prices as low as \$0.12 per kWh over 20 years. This trend is reflected in Bangladesh, where recent pilot projects have demonstrated the potential for cost reductions with improved technology and economies of scale (ADB, 2022). One of them was an industry representative who was encouragingly positive. He stated,

"The cost of wind energy is now comparable to fossil fuels, making it an increasingly attractive option for investors" (Interview 7, 2023)

His optimism can be a result of his hands-on experience with private sector investment and project creation, where exposure to cutting-edge technologies and global collaborations offers a more forward-looking view of cost trends. While this view is relatively optimistic compared to both other interviewees and the existing literature, it illustrates that some stakeholders see potential if structural and institutional challenges are addressed. Nevertheless, I think this perspective can be considered a positive for the future adoption of wind power in Bangladesh.

#### 4.3.2 Policy Recommendations and Stakeholder Engagement

Policy support for renewable energy is also growing, albeit gradually. The government has shown openness to private and international investors, as evidenced by ongoing partnerships with development partners such as the WB and ADB. This willingness to collaborate with international stakeholders is seen as a positive step toward achieving Bangladesh's SDGs, particularly SDG 7, which focuses on affordable and clean energy (GED, 2021). The academic, who is an environmental expert as well, quoted in his interview:

The supervision behind the NDC document was the Prime Minister herself. Even 10-15 years ago, there was no wind energy potential in Bangladesh according to the technology that existed in the world. Nowadays, new possibilities have been opened due to the development of technology. The government and policymakers are very interested in this matter. Overall, Bangladesh is trying to improve in this sector. However, we've only stepped on the first step if it's like climbing a 10-story building. (Interview 1, 09/10/2023).

This statement indicates the government's apparent enthusiasm in this regard. In summary, while significant technical and policy-related challenges remain, the potential for offshore wind, declining technology costs, and increasing policy support provide a hopeful outlook for the future of wind energy in Bangladesh. Taken together, the findings across this chapter show that wind energy development in Bangladesh is shaped by a combination of limited public awareness, institutional and data-related constraints, and mixed policy priorities among stakeholders. While there are clear technical potential and some optimistic views, these are outweighed by structural, infrastructural, and governance barriers that hinder implementation. This overall pattern provides the foundation for the deeper analytical discussion that follows in the next chapter.

## 5. Analysis and Discussion

The themes presented in this chapter are therefore not only inductively derived from participants' accounts but also structured through the theoretical concepts of sociotechnical imaginaries and materiality. This allows the analysis to move beyond surface-level descriptions and instead examine how visions, perceptions, and physical infrastructures shape the prospects and challenges for wind energy adoption in Bangladesh.

### 5.1 Technocratic Imaginaries in Bangladesh

The Sociotechnical Imaginary (STI) framework provides a lens to analyze how collective visions and societal structures influence wind energy adoption in Bangladesh, where fossil fuel narratives have long shaped both policy and public discourse (Jasanoff & Kim, 2009). These narratives prioritize energy security and economic growth, deeply embedding reliance on conventional energy sources like natural gas and coal into the nation's development strategies. However, Bangladesh's international commitments, such as signing the Paris Agreement and aligning with Sustainable Development Goals (SDG 7), emphasise the need for sustainable and affordable energy, encouraging the emergence of alternative imaginaries focused on sustainability and decentralised energy systems. These new imaginaries are shaped by contributions from diverse stakeholders, including international agencies and donors like USAID, the EU, and ADB, which provide technical and financial support, as well as advocacy from civil society and academics who highlight the urgency of renewable energy transitions.

Despite these shifts, systemic inertia tied to fossil fuel dependency and institutional limitations continues to impede progress. The sociotechnical system's existing structure, including policies, energy infrastructure, and public perceptions, reflects a reluctance to fully embrace wind energy as a viable alternative. However, there are signs of change that have been found. Several interviewees mentioned that the successful implementation of the "Kusruskhul Wind Farm", Bangladesh's first large-scale wind project (60 MW) in Cox's Bazar, will showcase the potential for



wind energy to contribute to energy security and sustainability. Such projects can play a pivotal role in reshaping collective visions by demonstrating success and inspiring broader acceptance. Bridging the gap between fossil fuel dominance and emerging sustainable energy imaginaries requires coordinated action, including clear policies, enhanced public awareness campaigns, and investments in capacity building. By aligning societal perceptions with international commitments and local opportunities, Bangladesh can advance its wind energy agenda while fulfilling its broader sustainability goals.

## 5.2 Materiality: The Physical Barriers of Wind Energy

The concept of materialities in wind energy adoption emphasizes the tangible and infrastructural elements that significantly influence the feasibility and public perception of renewable energy projects. In Bangladesh, material challenges such as inadequate road networks, port facilities, and site-specific wind data collection exacerbate technical obstacles, making the implementation of large-scale wind energy projects logistically and financially demanding (Kuchler & Bridge, 2018). For example, the transportation of large turbine components to remote or coastal areas like Cox's Bazar requires specialized infrastructure, which is currently lacking (Das et al., 2023). These material challenges are deeply interlinked with broader sociotechnical imaginaries, as they not only determine the technical feasibility of projects but also shape societal and institutional perceptions of wind energy as a viable alternative to fossil fuels (Jasanoff & Kim, 2009). Addressing these materialities requires a coordinated approach that includes upgrading infrastructure, improving resource mapping, and fostering stakeholder collaboration to align the physical and societal dimensions of wind energy development.

## 5.3 Interplay between Social Imaginaries and Technocratic Imaginaries in Bangladesh's Wind Energy Transition

Reviewing interviews, policy documents, and other data collected for this study, I find that the application of the socio-technical imagination (STI) framework highlights an important tension between two distinct but interconnected

imaginings that shape the wind energy landscape in Bangladesh: the technological imagination and the social imagination. While both are related to imagining an improved energy future, their construction, prioritisation, and communication in the context of wind energy development appear to be significantly different.

Until now, the technological imagination in Bangladesh has been largely driven by experts, policymakers, and international donors. This vision is clearly reflected in policy documents such as the Technology Assessment, Global Climate Targets and PSMP (2016), the Eighth Five-Year Plan, and the NREL Wind Map (2018). It focuses on data-driven solutions, site-specific wind resource maps, infrastructure development, foreign investment, and capacity building, with the aim of achieving energy security and sustainability (Jasanoff and Kim, 2009). However, this imagination has largely remained at various levels, from top to bottom, and appears to operate within institutional and technological boundaries.

On the other hand, the social imagination of energy transition in Bangladesh, especially in the case of renewable energy, is largely influenced by everyday experiences, cultural preferences, media narratives, and so on. As my interview revealed, the general public's perception of renewable energy is still largely related to solar power, as off-grid solar home systems in rural areas have been widely adopted among rural Bangladeshis. In contrast, wind power still seems distant, experimental, and sometimes out of touch with their immediate energy needs. As one journalist noted in his interview for this thesis, "When people here talk about renewable energy, they talk about solar power. Wind came much later, and many are not sure if it even works." (Interview 6, 10/07/2023).

Thus, a disconnection between technocratic and social imaginings is felt in Bangladesh. This disconnect is described by Hess and Sovakul (2020) as an imaginary dissonance, where expert-driven planning fails to resonate with local communities or capture their aspirations. In the Bangladeshi context, this gap is particularly visible because wind energy projects have yet to deliver widespread, visible benefits to local communities, unlike solar energy, which has clear success stories.

Furthermore, the material challenges discussed earlier, such as inadequate infrastructure, technical failures in early projects, and lack of location-specific

information, have reinforced public scepticism about the use of wind energy, contributing to a fragmented social imagination of wind energy that is cautious, uncertain, or indifferent.

This gap cannot be closed by simply addressing economic or technological issues. Bridging this gap requires moving beyond technical or economic solutions. As the STI literature suggests (Jasanoff, 2018), successful energy transitions depend not only on technical capabilities but also on the co-production of imagination among state actors, experts, and the public. It can therefore be argued that greater public engagement, community participation, and increased awareness campaigns will align the technical vision of wind power in Bangladesh with the social experiences and expectations of the mass people.

To overcome this imaginary dissonance and develop a more inclusive vision for wind energy adoption in Bangladesh's future, storytelling, local consultation, and showcasing the socioeconomic benefits of wind power can all be crucial strategies.

## 5.4 The Potential for Convergence: Moving Toward Inclusive Energy Futures

The findings of this study suggest that despite these tensions, the technical and social visions of wind energy in Bangladesh are not necessarily incompatible. There are emerging opportunities to build alignment between them. Strengthening local education and capacity-building initiatives in wind energy can gradually build a skilled workforce, and this can shift social perceptions from scepticism to ownership. Communicating the success of a wind power project to the public can play a significant role in changing public attitudes. For example, several interviewees in this study opined that the ongoing “Kusruskhul wind farm”, if successful, would further accelerate wind power generation in Bangladesh.

Furthermore, ensuring greater community participation in project planning and equitable distribution of benefits will increase public trust and engagement. This type of strategy, i.e., combining principles of balancing technological priorities and social inclusion, can be effective in bridging the gap between institutional perspectives and everyday life experiences. Turnhout et al. (2020) suggest that knowledge production and imagination are deeply intertwined. For instance,

building local expertise in wind energy can shift the social imagination from scepticism to ownership, creating a more inclusive and sustainable vision of renewable energy in Bangladesh. Ultimately, it can be argued that successful energy transitions depend not only on technical and economic readiness but also on the alignment of institutional strategies with public values, aspirations, and experiences. This is also true for the process of generating electricity through wind energy in Bangladesh.

## 5.5 Wind Energy in Regional Context: Lessons from the “Khurushkul” Wind Project and Neighbouring Countries

A more grounded understanding of wind energy adoption can be obtained by incorporating real-world experiences from both domestic and regional contexts. In Bangladesh's history of renewable energy, the “Khurushkul Wind Farm” in Cox's Bazar has reached a significant milestone with its operationalization. Khurushkul is a concrete step from planning to completion as the nation's first large-scale wind project (60 MW), carried out by the Bangladesh Power Development Board (BPDB) and funded by Chinese cooperation. The project demonstrates that wind energy can be technically viable in Bangladesh's coastal regions, aligning with findings from earlier resource mapping studies. For instance, early reports from the Power Development Board (PDB) indicate that the site benefits from consistent wind speeds exceeding 7 m/s at 100 meters hub height, aligning with earlier resource assessment by USAID, 2018 (Islam et al. 2021). In addition, stakeholders interviewed for this thesis noted that Kurushkul's successful commissioning has already begun to shift perceptions among policymakers, strengthening the argument for wind energy in national energy planning. It also highlights persistent structural constraints, such as inadequate grid capacity, a lack of local technical expertise, and an unclear operational framework for maintenance and more community involvement. These difficulties draw attention to the material and institutional dimensions of implementing wind energy in the sociotechnical context of Bangladesh.

Comparative insights from neighbouring countries, particularly India and Sri Lanka, further contextualize these findings. India's extensive wind energy program, which now exceeds 44 GW of installed capacity (MNRE, 2023), has been enabled by long-term policy consistency, robust public–private partnerships, and local manufacturing capacity (Sharma & Sinha, 2019). States such as Tamil Nadu and Gujarat illustrate how early investment in wind mapping, feed-in tariffs, and transmission infrastructure can transform technocratic aspirations into social acceptance and national progress. Similarly, Sri Lanka's Mannar Wind Power Project (100 MW) exemplifies how donor-supported initiatives, backed by environmental safeguards and public consultation, can integrate social legitimacy into technical success (ADB, 2020).

These regional examples highlight both transferable lessons and missed opportunities for Bangladesh. India's experience underscores the importance of predictable policy frameworks, long-term policy continuity, and local manufacturing capacity in making wind energy both technically and socially viable. Similarly, Sri Lanka's Mannar Wind Power Project demonstrates how early stakeholder involvement, donor coordination, and transparent communication can ease project implementation and enhance public acceptance. However, Bangladesh has not yet set up formal mechanism for knowledge sharing or study exchanges with these neighbouring countries, despite their geographical proximity and similar developmental circumstances. This lack of activities restricts potential for regional learning and technological adaptation. In considering this, Bangladesh's experience remains in its formative stage. The Cox's Bazar wind project could become a symbolic turning point if its success is communicated effectively and linked to public awareness, capacity-building initiatives, and institutional learning. Yet, without sustained policy support, replication of similar models, and strengthened regional collaboration, it risks remaining an isolated achievement rather than a catalyst for systemic change in the country's renewable energy landscape.

From the perspective of the STI concept, these regional experiences underscore that technological success alone is insufficient to reshape collective visions. Successful

demonstration projects have increased public confidence and facilitated the co-production of technocratic and social imaginaries in both Sri Lanka and India. For Bangladesh, nurturing a similar convergence will require transparent communication of project outcomes, greater inclusion of local stakeholders, and alignment between donor-driven visions and community-level expectations. These lessons suggest that regional learning and the careful documentation of early domestic experiences can guide Bangladesh toward a more inclusive and adaptive wind energy future.

These regional insights reinforce that Bangladesh's progress in wind energy will depend not only on domestic reform but also on learning from neighbouring countries' experiences in policy integration, stakeholder coordination, and community engagement. The next chapter synthesizes these findings and presents the study's overall conclusions and future research directions.

## 6. Conclusion

Bangladesh has limited energy supply and resources, with only natural gas being abundant. Domestic natural gas is the primary fuel, but its reserves will be depleted within the next 10-15 years unless new gas reserves are discovered. In contrast, Bangladesh's energy demand is growing and there is a global commitment to sustainable development. This thesis set out to explore the challenges and opportunities in wind energy adoption in Bangladesh, with the goal of understanding why the country's wind potential remains underutilised despite growing energy demand and global commitments to sustainable development. In doing so, it examines the dynamics among various factors influencing wind energy development in Bangladesh. Through qualitative analysis of policy documents, academic literature, and semi-structured interviews with key stakeholders, the study revealed that Bangladesh has significant natural potential for wind energy generation, particularly along its southern coastal belt. However, progress toward large-scale implementation has been slow and fragmented. The launch of the Kurushkul Wind Project, the country's first large-scale wind farm, nevertheless signals a pivotal moment in this emerging sector, offering both technical proof of concept and a valuable lens through which to assess broader institutional and social dynamics.

The central research question that guided this study was: Why is wind energy underutilized in Bangladesh, and what are the main barriers to its adoption? The study found that the answer lies not only in economic and technical constraints, but also in the intricate interaction of sociotechnical, institutional, and perceptual factors. Structural barriers, including inadequate site-specific data, inconsistent policy coordination, and limited investment in research and development, continue to hinder progress. At the same time, cultural and educational gaps have limited public understanding and trust in wind energy compared to the more familiar and visible solar sector. The underdevelopment of wind energy, therefore, reflects not a lack of potential, but the absence of an integrated vision connecting technology, policy, and society.

The Sociotechnical Imaginary (STI) concept provided a valuable lens to interpret these findings. It revealed a persistent dissonance between technocratic imaginaries, dominated by policymakers, engineers, and international donors, and social imaginaries, shaped by local experiences, awareness, and expectations. While the technocratic vision focuses on national energy security and technical feasibility, it often fails to resonate with community-level priorities or to cultivate a sense of ownership among citizens. In addition to technology innovation, narrative transformation is required to bridge this gap. This includes communicating success stories, encouraging participatory planning, and aligning policy language with public aspirations. The Kurushkul Wind Project, if managed transparently and inclusively, has the potential to embody this convergence and redefine Bangladesh's collective imagination of renewable energy.

From the perspective of materiality, the study also highlighted how physical infrastructures, such as roads, ports, transmission grids, wind resource data etc., both enable and constrain wind energy development. These material conditions are not merely technical obstacles; they shape the very possibilities of what can be imagined, planned, and achieved. Inadequate logistics for transporting turbine components or integrating variable power into the national grid, weak port infrastructure for handling oversized equipment, limited coastal transmission capacity, the absence of reliable long-term wind measurements, and the challenges of building durable foundations in cyclone-prone, low-lying terrain all directly influence institutional priorities and public perceptions of feasibility. Addressing these constraints requires long-term investment in infrastructure and local technical capacity to ensure that material realities support, rather than undermine, sociotechnical visions.

By integrating a regional comparative perspective, this study deepened its empirical grounding and contextual understanding. Experiences from India and Sri Lanka demonstrate how stable policy frameworks, local manufacturing, and community engagement can accelerate renewable energy adoption. These regional cases underscore that technological capability must be coupled with societal inclusion and institutional coherence. For Bangladesh, the lesson is clear. The success of wind energy depends not only on harnessing natural resources but also



on nurturing the human, institutional, and infrastructural ecosystems that sustain them. The Kurushkul project, if followed by continuous learning and replication, could mark the beginning of a transformative phase in the country's renewable energy journey.

I believe that Bangladesh stands at the bottom of a tall tower of wind, taking its first steps, and many more to come, with extraordinary hope. The foundations, for instance, policy attention, technical feasibility, and donor interest, are now visible. Yet, moving forward requires perseverance, shared imagination, and the courage to integrate technology with social learning.

To fully harness the promise of wind energy, Bangladesh must therefore move beyond a technocratic approach and embrace a more inclusive and co-productive model of energy transition, one that values education, public dialogue, and long-term capacity-building alongside engineering excellence. By connecting policy ambition with public imagination, the country can transform wind energy from an isolated experiment into a cornerstone of its sustainable energy future.

## 6.1 Recommendation for future research

This study explores the socio-economic and institutional aspects of wind energy adoption in Bangladesh. However, I believe that further research is needed to deepen and expand these insights. In order to assess how public perceptions, policy responses, and technical performance evolve over time, future research might initially focus on continuous case studies of current and planned wind projects, like the Kurushkul Wind Farm. Such research would be useful in determining whether initial optimism results in long-term institutional learning and social acceptance.

Second, comparative regional studies throughout South Asia may highlight common obstacles and opportunities in the shift to renewable energy. The empirical basis for cross-border knowledge exchange and cooperative policymaking would be strengthened by looking at how neighboring nations like Nepal, India, and Sri Lanka handle community engagement, policy consistency, and private sector involvement.

Third, future research could use a mixed-methods approach, integrating quantitative analysis of energy production data with qualitative exploration of

social and political processes. This would allow for a more comprehensive understanding of how material circumstances, policy narratives, and social imaginations interact to shape the energy transition. Finally, I believe that as wind power becomes more visible in Bangladesh's energy mix, public education and participatory research should be prioritized. Collaborative research involving universities, local governments, and communities can build indigenous expertise and bridge the current knowledge gap between technocratic planning and public understanding. Building such local research ecosystems, in my opinion, will be essential to ensuring that wind power not only produces electricity but also promotes a sense of collective ownership and sustainable progress.

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## Popular science summary

As the world searches for clean energy solutions, wind power is emerging as a sustainable option. Developed countries such as Denmark and Germany have successfully developed wind power. Although studies have shown that developing countries like Bangladesh have great potential for wind power development, especially in their coastal areas, it has still been very slow.

This thesis explores why wind power is underutilized in Bangladesh, i.e. why the pace of wind power adoption is slow. Based on interviews with relevant organizations, authorities, engineers, researchers, and other key stakeholders, as well as policy reviews, the study explores both the opportunities and the barriers to wind energy development. The findings first sowed a mix of interrelated, multifaceted, and complex challenges. These include policy gaps, limited infrastructure, and a lack of public awareness or visible success stories. Later, it also uncovers the recent attempts and future potential of harnessing wind energy in Bangladesh.

What makes this research unique is its use of the Sociotechnical Imaginary (STI) framework, which looks at how society's shared beliefs, hopes, and fears influence decisions about technology. the research shows that while policymakers focus on technical goals and international targets, ordinary people often feel disconnected from these ideas. Wind energy is still seen as uncertain by the public and local population, especially compared to more familiar sources like solar.

Still, there are glimmers of hope. The move to test the feasibility of offshore wind project and the recent inauguration of Bangladesh's first large-scale wind farm in Cox's Bazar could be a game-changer.

In summary, this thesis argues that wind energy is not just a technical or economic solution; it is a social and political solution, shaped by imagination, trust, and collaboration. Unleashing its full potential in Bangladesh requires not just better turbines but better stories, policies, and people working together towards a shared energy future.

# Appendix 1

## **Interview guide:**

### **Questions for the interview**

#### **General Questions**

- What is the current status of wind energy development in Bangladesh?
- What role can wind energy play in Bangladesh's energy mix, and how can it contribute to the country's sustainable development goals?
- How can the government of Bangladesh and private sector players work together to promote the development of wind energy projects in the country?
- What are the main policy and regulatory frameworks that govern the development of wind energy projects in Bangladesh, and how can they be improved to facilitate further growth in the sector?
- What is your vision for the future of wind energy in Bangladesh, and what steps do you think need to be taken to achieve that vision?

#### **Objective Specific Questions**

- What are the main reasons wind energy has not been widely adopted for power generation in Bangladesh?
- How do wind energy costs compare with other electricity sources in Bangladesh?
- What barriers do wind energy companies face when seeking to develop projects in Bangladesh?
- What is the level of awareness among policy-makers regarding the potential of wind energy in Bangladesh, and what steps can be taken to increase their understanding of its benefits?
- How can the public perception of wind energy be improved to increase its adoption in Bangladesh?

- What are the main challenges faced by developers of large-scale wind projects in Bangladesh?
- How do land-use policies impact the feasibility of wind energy projects in Bangladesh?
- What is the level of technical expertise and infrastructure in Bangladesh to support the development of large-scale wind projects?
- What are the implications of Bangladesh's weather patterns and monsoon season on the feasibility of wind energy projects?
- How do regulations governing the development of large-scale wind projects in Bangladesh compare with those in other countries, and what improvements could be made to facilitate their establishment?

Instead, how can the regulations governing the development of large-scale wind projects in Bangladesh be improved to facilitate their establishment?

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