

The Role of Energy Finance in Promoting Renewable Energy Investments in Bhutan

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BRAC Business School

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Declaration

It is hereby declared that

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

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Abstract

As a carbon-negative nation that is richly endowed with natural resources, Bhutan is well placed to innovate in renewable energy financing. Through energy finance, stakeholder engagement, funding sources, and green financial instruments, this thesis explores the role of energy finance to venture forward a growing renewable sector in Bhutan. Although hydropower accounts for the vast majority of these, seasonal variables and climate risks call for diversification. The study employs a mixed-methods approach and shows that public funding defines hydropower as “large-scale,” while solar and wind remain under-funded. Policy uncertainties, high costs and weak incentives lead to low private investment. Bhutan is still not leveraging green financial instruments despite having great potential within the carbon trading global market. Practices that can strengthen policies, streamline public funding, and facilitate public-private partnerships might fill in the gaps to ensure Bhutan’s energy transition, security, and economic resilience, providing learnings for other similar economies.

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Chapter 1: Introduction

1.0 Introduction:

Energy finance is a vital enabler for a global shift to sustainable energy systems. This is especially relevant in the case of Bhutan as the nation is rooted in an integral political pursuit of environmental conservation and sustainable development (Bhutan Trust Fund for Environmental Conservation, 2024)). In parallel, the climate crisis continues to grow in urgency, as international efforts to promote energy transition begin to rapidly scale-up, highlighting the role of financial mechanisms to facilitate sustainable energy investment (World Bank, 2023). Energy finance for Bhutan goes beyond an instrument for addressing domestic energy security; it also represents an opportunity for Bhutan to position itself as a global leader in sustainable energy practices (BBS, 2023).

Bhutan as an example of Environmental sustainability Despite Bhutan's small size, its carbon-negative status, owing to its evergreen forests and reliance on renewable energy, has helped it become ranked as one of the greenest countries in the world (World Bank, 2023). This positioned makes a strong argument for why alternative models of financing that are aligned with national energy objectives and global commitments to climate action must be explored (Bhutan Trust Fund for Environmental Conservation, 2024). However, the success of such mechanisms is highly reliant on sound stakeholder collaboration, effective public funding, and the incorporation of green financial discipline into the existing framework (ADB, 2020) With Bhutan on a path to balance economic growth and environmental stewardship, this research seeks to understand the role energy finance plays in diversifying and expanding its renewable energy economy.

1.1 Research Background

Hydropower plays an extensive role in Bhutan's economy; nearly 99% of its electricity production comes from hydropower (Rinzin, 2017). Although hydropower has been at the foundation of Bhutan's economic policy for decades, both as an export commodity and a source of local energy security, it is an imperfect solution. The seasonal variations in water flow result in a peak of

electricity generation in the monsoon season and a shortfall during winter months. But this heavy dependence on hydropower has also left Bhutan exposed to climate-related risks, as more erratic weather is changing water availability.

Bhutan is rich in diverse potential for solar, wind and biomass energy, enabling it to solve these problems through diversification of its renewable energy sources. Hydropower generation, for instance, would be better powered by solar energy capable of providing reliable power throughout dry winter months. Wind and Biomass energy provide further avenues to diversify renewable energy mix. But, it has been slow in progress owing to multiple financial constraints and a lack of infrastructure and high initial investments in these technologies (BBS, 2023).

With climbing impacts of climate change, Bhutan's work to diversify its renewable energy mix has assumed even greater urgency. Moreover, due to climate disruptions, the stability of hydropower generation is threatened—and this stresses the need for a more resilient and adaptive energy system. Meeting this transition, of course, requires inventive financial means, such as public-private partnerships, international financing and additional traditional financial devices, such as green bonds and carbon credit scores. Some of the tools that Bhutan can use to rally resources needed to spur investment into renewable energy and help the world take on carbon emissions.

Bhutan operates on very strong policy focus on renewable energy; however, achieving these goals is not free of challenges. Public funding has been crucial, but has focused mostly on big hydropower projects, leaving other renewable technologies on the sidelines. Effects of regulatory bottlenecks, misaligned incentives and weak risk-sharing arrangements limit private sector participation. Moreover, the application of green financial instruments is rather unexplored and the awareness from stakeholders and supporting infra to make this work is missing. This may limit Bhutan's ability to monetize its renewable energy potential and achieve its sustainable development goal.

This study is embedded in the in this framework to conduct my research and to address how energy finance could be the overdue bridge for such remains. The study provides insights on practices of stakeholders and the roles of both public and private sectors and the scope to deploy green financial instruments that can pragmatically guide a pathway for Bhutan in this transition phase.

1.2 Problem Statement

Though lucrative interdependencies like Bhutan's dependence on hydropower may seem appealing, the cost is an unsustainable risk to the energy security and sustainability. The seasonal variability of hydropower — now further worsened by climate change's impact on water supply — emphasizes the necessity to diversify other green energy pursuits, from solar to wind to biomass. However, this diversification is both a requisite (due) to ensure uniformity in energy supply to Bhutan and is vital in minimizing Bhutan's vulnerability to climate change and in fulfilling its environmental sustainability commitments (Rinzin, 2017).

But the path to diversifying energy sources is fraught with challenges. Public funding has generally favored large-scale hydropower, underfunding alternative technologies. These barriers hinder the private sector, which is crucial in funding and executing renewable energy developments, from dealing with large upfront expenses, regulatory risks, and less-than-sufficient motivations. Also, green financial instruments like green bonds and carbon markets are still to be leveraged enough in Bhutan to make an impact as they have in other parts of the world. So far, policy gaps, lack of infrastructure and low levels of stakeholder awareness means these tools are currently underused (BBS, 2023).

That likely creates a rift between Bhutan's policy aspirations and ground realities. While policies at the national level emphasize supply diversification of renewables and coordination among stakeholders, direct evidence of implementation is limited. Stakeholders often operate in silos, where unaligned priorities and poor coordination diffuse the effectiveness of the mechanisms that drive energy finance. This raises a question on Bhutan's readiness to achieve its renewable energy targets sustainably and climate-resiliently (World Bank, 2023).

This analysis strives to address that gap by investigating the role of energy finance in accelerating renewables investment in Bhutan. It will expand on these issues through stakeholder practices, contributions of public and private sectors, and green financing tools, which leads to practical implications to fill the polyester policy-finance-implementation gap. With this, it is engaging in broader discourse around sustainable energy finance, which is critical to the achievement of national as well as global climate goals.

1.3 Research Objectives

1. To understand stakeholder views and practices in renewable energy financing in Bhutan.
2. To examine the role of public funding in renewable energy projects.
3. To study private sector involvement in renewable energy investments.
4. To evaluate how effective green financial tools are in supporting renewable energy.

1.4 Research Questions

1. What are stakeholder views and practices regarding renewable energy financing in Bhutan?
2. How does public funding contribute to the growth of renewable energy projects in Bhutan?
3. How effective are private investments in promoting renewable energy in Bhutan?
4. How effective are green financial tools in promoting renewable energy in Bhutan?

1.5 Significance of the Study

This study aims to address Bhutan's barriers in financing renewable energy projects in the country while providing directions to strengthen its policies and practices inline with global standards. It stresses the need for engagement with stakeholders, innovative financial tools and public-private partnerships to encourage investments. The research thus aids in energy security and reducing seasonal dependency on hydropower by promoting diversification of Bhutan's renewable energy sources. The outcome also resonates with Bhutan's pledge towards SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). The study intersperses useful recommendations that can make financial sustainability attractive to private sector participants, the key to continuous advances in Bhutan's renewable energy objectives.

1.6 Definition of Key Terms

- **Renewable Energy:** Energy generated from natural processes that are continuously replenished, such as solar, wind, hydropower, and biomass.
- **Energy Finance:** The mechanisms and strategies used to mobilize funds for energy projects, including public funding, private investments, and international financing.

- **Green Financial Tools:** Financial instruments —green bonds, carbon markets, etc. — that are organized to encourage environmental responsibility.
- **Public-Private Partnerships (PPPs):** The arrangements between government agencies and the private sector to fund and operate projects, taking risks and profits.
- **Carbon Markets:** Trading systems that let organizations buy and sell carbon credits as part of efforts to curb emissions of greenhouse gases.
- **Sustainable Development Goals (SDGs):** A set of 17 global goals established by the United Nations to tackle some of the most pressing global challenges, including clean energy

1.7 Organization of the Thesis

- **Chapter 1: Introduction** – Provides an overview of the research background, problem statement, objectives, questions, significance, key terms, and thesis organization.
- **Chapter 2: Literature Review** – Explores existing research, theoretical frameworks, and key concepts related to renewable energy financing.
- **Chapter 3: Methodology** – Describes the research design, data collection methods, and analysis strategies used to address the research objectives.
- **Chapter 4: Results and Discussion** – Presents the findings of the study and discusses their implications in the context of Bhutan’s renewable energy landscape.
- **Chapter 5: Conclusion and Recommendations** – Summarizes the research findings, highlights limitations, and provides actionable recommendations for policy and practice.

1.8 Chapter Summary

In this chapter, the background and context of the research topic were presented, along with the problem statement, research objectives and the research questions. It also emphasized the

importance of the study, outlined key definitions, and discussed the thesis organization. The chapter sets the stage for subsequent literature, methodology, findings, and conclusions that will address renewable energy financing challenges in Bhutan.

Chapter 2: Literature Review

2.0 Introduction

This chapter aims to summarize the existing literature regarding renewable energy financing and its relevance to the context of Bhutan. This chapter synthesizes studies from previous works to achieve a widespread theoretical and practical understanding for energy finance. It looks at critical frameworks, financing mechanisms, and stakeholder contributions that affect renewable energy investments. Not only does this literature review reveal best practices and challenges, it also points out gaps in existing research, thus rationalizing the need for this study.

2.1 Theoretical Framework

Renewable energy project financing is based on a complex ecosystem of economic and policy theories that underpin project financings investment decisions and resource allocations. Risk-return trade-off risk vs. return trade-off– You have to balance risk and return. Risks in the context of renewable energy are often related to high initial capital investment, technology risk and changing policy frameworks. Nevertheless, those risks are outweighed by the long-range advantages like environmental sustainability, decreased reliance on fossil fuels, and economic growth via clean energy markets (UNDP, 2022).

Another relevant theoretical structure is public goods theory, understanding renewable energy as a resource that is both non-excludable and non-rivalrous. This viewpoint underlies the need for government intervention either through subsidizing the costs of renewable energy initiatives to make it available for all or by analyzing and correcting market failures. In Bhutan, this theory is particularly salient in light of the country's goals of providing sustainable energy solutions under the auspices of its Gross National Happiness philosophy (BBS, 2023).

International policy instruments like the Paris Accord are also important variables in renewable energy financing. These frameworks are designed to incentivize innovative financing instruments—like green bonds and carbon markets—to be used to help meet global climate goals. These mechanisms are all the more critical for Bhutan, which has committed to remaining carbon-neutral, as they provide avenues for the country to diversify its energy mix, reducing energy costs and enhancing economic viability (Kuensel, 2023).

Furthermore, the sustainable development theory serves as another pillar of this research as it emphasizes the relationship between economic growth, environmental protection, and social equity. By diversifying renewable energy generation, Bhutan is consistent with this theory as the nation is expanding its energy security, with the equitable distribution of renewable energy benefits across the nation. Recognizing these theoretical perspectives, this study investigates whether energy finance mechanisms could promote renewable energy investment in Bhutan.

2.2 Renewable Energy Landscape in Bhutan

Bhutan's energy profile is dominated by hydropower, which constitutes nearly 99% of its power generation, (i.e., Bhutan Hydropower Development Strategy, 2018B & International Renewable Energy Agency [IRENA], 2019) It has also allowed Bhutan to sell excess electricity, most notably to India, bolstering its economy as well. Nonetheless, seasonal fluctuations and dry months during winter lead to domestic energy shortfall — a reality that exposes the vulnerabilities associated with relying on single source of energy (IRENA, 2019).

Acknowledging these disadvantages, Bhutan has taken steps to diversify its energy portfolio by considering other renewable energy resources like solar, wind and biomass. The country has considerable potential here, totaling up to 12,000 megawatts (MW) of solar energy potential (Bhutan Trust Fund for Environmental Conservation, n. d.). For instance, DGPC entered into a joint venture with Tata Power, which will develop 5,000 MW of renewable energy projects (hydropower and solar) (Kuensel, 2023).

However, there are many barriers stopping these alternative energy resources from developing in a quick manner despite the hopeful potential. Barriers with high upfront capital costs, limited access to advanced technology, and unavailability of skilled labor. Lack of comprehensive policy frameworks and incentives for renewable energy investments are also significant barriers to implementation (International Centre for Integrated Mountain Development [ICIMOD], 2019).

Bhutan's renewable sector has huge potential for growth. The declining costs of renewable technologies worldwide are making investments more attractive. Bhutan, which is still committed to staying carbon-neutral and it has near the yards of large energy market (India), the potential

expansion of renewable energy project. International cooperation can promote these efforts; the European Investment Bank supports renewable energy investments in Bhutan (European Investment Bank [EIB], 2024).

2.3 Public Funding for Renewable Energy

When it comes to developing its renewable energy sector, especially its vast potential hydropower potential, the country will need more public funding. One good thing that RGoB decided was to work closely with international financial institutions for accessing loans for the energy projects. For example, in support of the country's goal to achieve carbon neutral status and to contribute to the climate goals of the global community, the OPEC Fund provided a US\$50 million loan to Bhutan (OPEC Fund, 2024) to increase its hydropower capacity

Additionally, the EIB is financing in parallel, with EUR 150 million, the project for about 310 MW hydropower and solar generation capacity. Thus, the projects promote energy security for Bhutan, while ensuring effective utilization of renewable energy production with high climate-impact implications (European Investment Bank, 2024).

So too has the World Bank, which in recent weeks approved a \$50 million financing package to assist Bhutan to strengthen policies toward a more resilient and sustainable economy. The goal of the initiative is to drive green growth and expand access to finance and markets, allowing for the private sector to develop in the energy market through renewables (World Bank, 2023).

And yet, these investments come with challenges. The large capital expenditure required to develop renewable energy projects and the much-needed advanced technologies and skilled labor too often drain public resources. Over dependence on external financing may also raise vulnerabilities, particularly when international capital is volatile.

These challenges have led the RGoB to seek innovative financing mechanisms and policy reforms inviting private investment and diversification of funding sources. It includes creating enabling environments for public-private partnerships and adopting policies which promote investment in renewable energy projects. Policy Initiatives in Renewable Energy Sector One notable instrument in 2016 for harnessing the know-how and finances of the private sector in 2016 was the Public Private Partnership (PPP) Policy, which specifically focused on public infrastructure, including renewable energy projects (Ministry of Finance, 2016).

While the development of renewable energy infrastructure in Bhutan has primarily been viewed through the lens of public funding, there is a growing recognition that a diverse mix of funding sources and private sector engagement are critical to the sustainability of the energy sector.

2.4 Private Sector Involvement

Private sector involvement in hydropower makes the sector less competitive, considering that the renewable energy sector in Bhutan is still limited to non-hydro power plant projects. Large hydropower projects have been historically developed through government initiatives and bilateral cooperation especially with India. But new policies are signaling a greater role for private investment on hydropower as well as other renewables.

One of the prominent highlights is the joint venture between Reliance Group and Druk Holding and Investments Ltd (DHI) of Bhutan. In this partnership, a new company, Reliance Enterprises, will be formed to exclusively focus on developing and investing in Bhutan's renewable energy sector. The venture also aims to build 1,270 MW of renewable energy, including a 500 MW solar project for Gelephu Mindfulness City and the 770 MW Chamkharchhu-1 hydroelectric project. This project is the biggest foreign direct investment (FDI) in the renewable energy sector of Bhutan by an Indian company (Renewables Now, 2024).

Likewise, Tata Power has signed a joint venture with Druk Green Power Corporation Ltd (DGPC) to build at least 5,000 MW of generating capacity of clean energy in Bhutan. This partnership also coincides with Bhutan's goal to expand its total production capacity to 25,000 for MW by 2040, moving away from traditional hydropower and venturing into solar and geothermal power generation (Business Standard, 2024).

Despite these encouraging developments, a number of obstacles still prevent wider private sector engagement:

- **Regulatory Challenges:** The current regulatory regime, catering to public sector driven projects, is established as per the Bhutan Electricity Act of 2001. The Act facilitated restructuring of the power supply industry and opening up of the sector through licensing and regulation for the private sector; however, the Act is under review to better facilitate

and incentivize private investments for the emerging energy landscape (Department of Renewable Energy, Ministry of Economic Affairs, 2019).

- **Financial Constraints:** Large capital expenditures and limited access of private investors to financing. These challenges are further compounded by a lack of strong financial incentives, like tax breaks or subsidies for renewable energy projects.
- **Infrastructure Limitations:** Inadequate infrastructure, particularly in remote areas with high renewable energy potential, increases project costs and complexity, deterring private investment.
- **Market Risks:** Uncertainties related to power purchase agreements, tariff structures, and potential market size can make investments less attractive to private entities.

RGoB is, therefore seeking for policy reforms to improve the enabling environment for private investment to mitigate with these challenges. Including streamlining the regulatory framework by establishing clear guidelines and incentives for the private sector participation, improving access to finance through multi-faceted public-private partnerships, and supporting infrastructure development by investing in renewable energy projects.

So while there is clearly a positive trend toward increased private sector involvement as indicated by recent partnerships between major Indian companies and Bhutan to develop the latter's renewable energy sector, existing barriers need to be addressed through strategic policy reforms and infrastructure development to sustain and expand this engagement.

2.5 Green Financial Tools and International Mechanisms

Bhutan is actively seeking new financial mechanisms to be able to enable its renewable energy ambitions and preserve its carbon neutrality. Of these, the sovereign green bond, funds issued by the government to finance environment-friendly projects, is a good instrument. Bhutan stated its intention to develop a system for issuing sovereign green bonds in November 2022 to attract investment to green projects and fill the green investment gap (Kuensel, 2022).

Bhutan is exploring international carbon markets to monetize its carbon sequestration capability with green bonds. The country has established a high integrity carbon market registry for proper

tracking, accounting and reporting of emission reduction units. (Kuensel, 2023) But now, the registry aims to position Bhutan as a player in the international carbon markets, furthering its efforts towards sustainability and adopting low-carbon solutions.

Additionally, Bhutan registered with the Climate Action Data Trust (CAD Trust), a World Bank-backed carbon meta-registry. Therefore, this integration increases transparency and efficiency in carbon market transactions, showcasing Bhutan's dedication to significantly contributing to the global endeavors to tackle climate change (Ledger Insights, 2023).

These initiatives are in line with the strategic goals of Bhutan's Renewable Energy Master Plan (2017-2032), which has identified 39,462 MW of technically viable small hydropower, solar and wind projects within the country (National Environment Commission, 2022).

Bhutan aims to harness green financial instruments and engage with international mechanisms to draw investment, stimulate sustainable growth, and play a role with the international community in tackling emissions of greenhouse gases.

2.6 Research Gaps

Although Bhutan has made great strides toward renewable energy advancement, there remain unresolved research questions which hinder a holistic approach to a varied and sustainable energy sector in the country.

First, although hydropower is an extensively developed renewable energy source, detailed assessments and pilot projects of alternative renewable energy sources (e.g., solar, wind, and biomass) are lacking. The Renewable Energy Master Plan (2017-2032) conveys great potential in these domains; yet, practical implementations strategies are still underexplored (International Renewable Energy Agency [IRENA], 2019). This disconnect hampers the diversification of Bhutan's energy mix, a crucial step towards bolstering energy security and adaptability in the face of climate variability.

Second, the socio-economic effects of diversifying the energy portfolio are still not fully investigated. This information informs research and policy at both the local and national levels to ensure both local communities and broader economic development are not sacrificed in the name

of a green transition. This is particularly because the existing literature has focused on the macroeconomic benefits of hydropower exports and has paid little attention to localized socio-economic outcomes (World Bank, 2024). This lag inhibits the creation of inclusive energy policies, so that benefits are distributed fairly across different population cohorts.

Thirdly, few studies exist on the effectiveness of existing policies in driving private sector investment. Policies, such as the Alternative Renewable Energy Policy (2013), exist to promote private participation in renewable energy development, but not much empirical work exists to identify their effectiveness and barriers to private investment in the context of Bhutan (Asian Development Bank, 2014). The absence of any such analysis hinders the ability to design specific measures that would promote increased private sector participation in renewable energy development.

Additionally, the environmental and ecological impact of large-scale renewable energy initiatives (aside from hydropower) remains unexamined. Evaluating the possible environmental effects would be critical to ensure that the growth of renewable energy complements Bhutan's commitment to environmental conservation (IRENA, 2019). Failure to conduct such assessments pose a potential for unforeseen environmental impacts which would contradict the sustainability emancipation of renewable energy projects.

Moreover, the lack of sufficient research in this area creates problematic scenarios, as integrating renewable energy sources into the existing grid infrastructure presents technical challenges. Grid stability, energy storage solutions, and the management of intermittent energy sources such as solar and wind, simply do not fall within the scope of a sustainability scholar in the public domain, and hence urgently require substantive research to identify effective integration mechanisms (IRENA, 2019). As Bhutan expands its energy mix, overcoming these technical challenges is essential to provide a dependable and resilient power supply.

Finally, there are few studies about consumer behavior and acceptance in relation to renewable energy adoption. Insights from analyzing public perception, willingness to pay, and behavioral responses regarding renewable energy initiatives can assist in designing effective campaigns and incentive mechanisms that encourage the adoption of clean energy technologies (IRENA, 2019). Such understanding is crucial for successful broad acceptance and engagement in renewable energy initiatives.

The necessity to respond to these research gaps has an essential role in developing a comprehensive understanding approach of Bhutan's renewable energy context and contributing to strategies for sustainable and inclusive energy development.

2.7 Conclusion

Bhutan's renewable energy sector is at a turning point, it has achieved great progress with hydropower and has limitless possibilities with other renewables. The international community has also rallied behind Indonesia's commitment to carbon neutrality and sustainable development, as shown by the European Investment Bank's announcement of €150 million in financing to support energy security through the diversification of renewable energy projects. This funding will enable year-round energy generation from renewables, supporting Bhutan's ambitious goal of year-round carbon neutrality. Knowing that barriers often impede private sector investment, the government is doing its part to change that through a series of reforms including amending and revising policies such as the Bhutan Electricity Act of 2001 and proposing new financing mechanisms such as sovereign green bonds to signal to the private sector that yes, they are serious about this, they are trying to eliminate barriers that may prevent private sector investment. Last but not least, Bhutan is also engaging earnestly in carbon markets at the global level where high quality carbon market registration and its inclusion in global databases in this regard adds to the boost in tackling climate change together at global level.

Although this is a significant step forward, other ailments including governmental policies, absence of funding, and insufficient infrastructure are still hurdles towards the engagement of the private sector and renewable technologies. Renewables can play a role in broadening the generation portfolio of electricity and can also insulate the system against variations in seasonal weather patterns and weather extremes that may disrupt supply. Climate change results in increasingly unpredictable weather conditions, and decreasing winter-month rainfall, along with reduced melting, can negatively affect river flow and hydroelectricity production. To sum up, even though Bhutan has a renewable energy landscape that is praiseworthy today, there are several hurdles that need to be jumped through, primarily by means of investments, policy changes, and a little nudge from international players. This will contribute to the sustainable and inclusive

development of the energy sector and is fully aligned with Bhutan's global objectives of environmental preservation and economic development.

Chapter 3: Methodology

3.0 Introduction

As for the methodology chapter, it lays out a systematic approach taken to investigate the role of energy finance in promoting renewable energy investments in Bhutan. This chapter also explains the research design, specifying the population and the sampling method used to collect the data and the tools and techniques to prepare data collection and data analysis. A structured framework is applied in the study to confirm the reliability and validity of the results and a transparent process that enables the replication and critical evaluation of the results. The methodology also elaborates on ethical considerations made to contribute to the protection of participant rights and integrity as well as potential limitations which could be detrimental to the outcomes of the study. Overall, this integrated approach helps to improve understanding of the connection between energy financing mechanisms and the evolution of renewable energy infrastructure in the case of Bhutan.

3.1 Research Design

This research utilizes a descriptive research design to fulfil the objectives of the study revealing the role of energy finance in promoting Bhutan in the renewable energy development. In this scenario, descriptive design fits best as it helps in identifying the understanding of phenomena; it collects and analyzes the qualitative and quantitative information from a selected target group with the help of questions. For the purpose of this study, the descriptive design enables an investigation of the different mechanisms, the perspective of stakeholders including policymakers, and the existing policies, all of which drive renewable energy investments in Bhutan contextually.

The design selected is they aligned with the objectives of the study which are looking to determine relationships, patterns, and difficulties in the field of energy finance. The researcher can collect more data either qualitatively or quantitatively, in depth description of the phenomenon under study which will help us to know how financial strategies behind renewable energy growth. This design also saves the inclusion of both primary and secondary data, allowing a complete analysis that reflects various perspectives and existing trends. This descriptive framework paves the path

for the study to deliver actionable recommendations that have potential implications for policy, strategic investments, etc. in Bhutan's renewable energy sector.

3.2 Population and Sample

The sample of the study includes those stakeholders who are associated with the renewable energy project investment in Bhutan. This encompasses stakeholders including policymakers, financial institutions, investors, project developers, and representatives from local communities that are directly or indirectly affected by renewable energy projects. Their insights and experiences are critical to understanding how energy finance mechanisms work, and how they interact with real-world renewable energy project development.

The participants are selected using a purposive sampling approach developed through a review of literature related to energy finance, specifically renewable energy investments. The sampling approach that is most suited for such research is purposive sampling, whereby participants are chosen due to their most likely capacity as a rich and relevant source of data. Participants are identified based on their work in energy finance or renewable energy projects, their professions and their role in formulating plans, or project implementations in Bhutan.

This study is done on total of 15 samples. This will be as per the principle of data saturation as participants will be included in the study until enough information is collected to answer the research questions adequately. This allows a diverse range of perspectives to be incorporated while still remaining feasible within the time constraints of the study. The purposive sample of stakeholders is a representative of the main actors of the energy finance and renewable energy landscape in Bhutan, thus forming a solid basis for analyzing the link between energy finance and renewable energy investments.

3.3 Data Collection Methods

The primary and secondary data collection methods are used in this study to streamline an analysis of the energy finance and its potential in Bhutan to realize a green energy friendly investment environment. These methods were chosen intentionally to reflect a variety of perspectives and create a strong basis for analysis.

3.3.1 Primary Data Collection

A Google Form survey was distributed to the key stakeholders in Bhutan's renewable energy sector (15 participants) to collect primary quantitative data. The form includes open-ended and close-ended questions. Closed-ended questions were inserted to extract a certain type of structured data that would be possible to count and compare among the interviewees and open-ended questions were formulated in a way for interviewees to elaborate on their experiences, observations and opinions. The data output of recommended best practices for the research study such a mix of both quantitative and qualitative data collection methods conducted online.

3.3.2 Secondary Data Collection

Data collection involved secondary data obtained from selected documents such as governmental reports, policy papers, academic articles, and industry magazines. Moreover, these texts provided contextual and historical background that complemented the primary information. These works assessed the prevailing financial patterns; policies and the challenges in financing renewable energy in Bhutan.

By collecting both primary and secondary data through a mixed-methods approach, this allowed the analysis to be enriched with both immediate perspectives of stakeholders and the broader context gleaned from the relevant authoritative literature. This model provided a means to examine the interrelationship between renewable energy development and energy finance in Bhutan in detail.

3.4 Data Collection Tools

Google Form and Secondary Document (the only needed type of documents) were used as data collection tools in this study as it allows for collection of data in an efficient and confident manner.

Google Form:

We recruited 15 participants via Google Form for a pilot run. Strategically designed with both open and close-ended questions to ensure that it addressed research objectives. For this first phase, data was collected in the form of close-ended questions, which provided qualitative attention on topics such as financial mechanisms, stakeholder roles, and challenges regarding renewable

energy investments. which allowed respondents to specify and elaborate their thoughts and experiences giving a more qualitative insight into the subject. A Google Form was chosen for data gathering due to its ease of access and would facilitate auto collection of the data especially in a geographically diverse country such as Bhutan.

Selected Secondary Documents:

For secondary data collection, document selection was generally based on relevance and reliability. These included government reports, policy papers, academic articles and industry publications. Such documents were studied for contextual and historical information regarding the health of the financial systems and renewable energy policies in Bhutan. This new methodology positioned the study by only choosing high quality papers.

The use of these systems for the collection of primary and secondary ensured a thorough analysis, followed by an interpretation of the findings.

3.5 Data Analysis

The data analysis process for this study was developed to provide a systematic interpretation of the quantitative and qualitative information gained through the Google Form and supplementary documents. The combination of qualitative methods was powerful and allowed for a thorough exploration of the influence energy finance has on renewable energy investments in Bhutan.

3.5.1 Quantitative Data Analysis

From the close-ended questions from Google Form the quantitative data were generated and analysed. Responses were classified to identify patterns and trends regarding the financial mechanisms, the roles of stakeholders and barriers of renewable energy investments. Frequencies, percentages and comparisons were computed to showcase similarities and differences among responses from participants. This quantitative information offered an organized view of thematic elements considered beneficial considering the research goal.

3.5.2 Qualitative Data Analysis

Thematic analysis was applied to the qualitative data from the open-ended questions. Responses were coded using an open coding approach to determine recurring themes, patterns, and relationships. Based on the study's goals (including the effectiveness of financial strategies,

barriers to investment and policy effects), key themes were derived. Thematic analysis was utilized to enable exploration of detailed viewpoints expressed by participants, to capture them in depth, and reflect the complexity of lives and experiences and viewpoints captured.

3.5.3 Secondary Data Analysis

The relevant secondary documents such as reports, publications, presentations concerning energy issue in Bhutan were extracted and analyzed using the technique of content analysis to elaborate and summarize information on Bhutan's energy finance policies, investment trends, and renewable energy initiatives. This included coding for key concepts, categorizing, and comparison with the findings from the primary data for a confirmatory and complementary view of participant insights.

As a result of these approaches, the data analysis garnered a well-rounded view with regard to the interpretation of both quantitative trends and qualitative insights. This comprehensive accounts and process to analyses to interpret data leading to an understanding of energy finance modalities and their impact on the uptake of renewable energy in Bhutan aligned well with the goals of the study.

3.6 Ethical Considerations

All ethical concerns as defined by the 1979 National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research were taken into account in order to ensure both the integrity of the study and the rights of those involved. Trust was built, and the data were protected via ethical standards with respect to data privacy, and the validity of the research.

3.6.1 Informed Consent

All participants were made aware of the aim of the study, their involvement in research, and their right to withdraw at any point without any consequence. Participation was completely voluntary; consent was obtained by a formal consent form in the Google Form. This guaranteed that participants knew and consented to provide their feedback.

3.6.2 Anonymity and Confidentiality

The anonymity of participants was strictly maintained. Identifiable information was neither collected nor disclosed in the study's findings. Responses were stored securely and used exclusively for the purposes of this research. Measures were taken to ensure that the data collected remained confidential and accessible only to the researcher.

3.6.3 Ethical Approval

Ethical approval was obtained from the relevant institutional or organizational review board before commencing the study. The procedure of ensuring compliance with corresponding ethical standards in the research design, data collection methods and analysis process began in this step.

3.6.4 Cultural Sensitivity

Special care was taken to formulate questions and engage with participants in a way that respected the values, norms, and traditions inherent to Bhutanese culture and socio-political context. This enabled them to make the research process respectful and inclusive.

In dealing with these ethical issues the study was able to maintain high ethical standards which derives the reliability of its results and the welfare of its subjects.

3.7 Limitations

Though this study gives important insights into the role of energy finance in promoting investments into renewables in Bhutan, there are several limitations which should be acknowledged. This also emphasizes some of the contextual and methodological limitations faced during the research process.

3.7.1 Sample Size and Scope

The limited sample of only 15 participants, although sufficient to reach data saturation, may not encompass the full spectrum of opinions in Bhutan's renewable energy sector. Furthermore, the research emphasized certain stakeholders, which may have limited the perspective of those that were less represented, including grassroots organizations or international investors.

3.7.2 Reliance on Self-Reported Data

Note that the data obtained via the Google Form were based on self-reported responses from the participants, which may be susceptible to personal biases, recall errors, or unwillingness to share sensitive information. It is possible this affected the comprehensiveness of and correctness of the results.

3.7.3 Geographic and Sectoral Context

This study is context specific to Bhutan and thus cumulative findings may not apply to other locales/countries. Variation in policy frameworks, financial mechanisms and cultural contexts may produce different outcomes in other settings.

3.7.4 Time Constraints

Data collection for this research was conducted in a short period of time, limiting the potential use of follow-up interviews or discussion sessions. This restriction could have hindered the opportunity to address particular themes in more depth.

3.7.5 Secondary Data Availability

Although the study used some secondary documents selectively, in ensuring the availability and accessibility to comprehensive, up-to-date data on Bhutan's energy finance policies and renewable energy projects remain challenging. Limitations of the analysis (e.g. secondary data gaps) may have limited its contextual depth.

These limitations made the study more of a stepping stone to understand the issue, and by revealing these limitations, the study offers an open-book framework for how its findings should be viewed and encourages future research to overcome these issues to gain a more holistic understanding of the issue.

3.8 Conclusion

This chapter on methodology discusses the step-wise strategy implemented to investigate the potential of energy financing to facilitate the growth of renewable energy sector in Bhutan or not. Using a descriptive research design, the study utilized primary and secondary data collection methods, including both structured and unstructured responses collected through Google Forms

and insights from selected secondary documents. This study employed a purposive sampling approach to recruit 15 key informants in Bhutan who have influence over its renewable energy landscape, a strategy that helped yield insight-rich and contextually relevant information.

The methodology is a transparent and precise application of the data collecting instruments, solid schemes for quantitative and qualitative data analysis and high ethical standards. The methodology behind these decisions mirrors the research objectives, ensuring reliability, validity, and transparency.

Though not without its difficulties, including a small measurement sample and the geoclimatic nature of Bhutan, the approach gives a strong ground for exploring the nuanced relations between mechanisms of energy finance in the context of renewables deployment. The results are therefore more reliable and useful for the energy finance and sustainable development domain.

Chapter 4: Findings and Analysis

4.0 Introduction

The results of the analysis of primary data collected through Google Form survey data and secondary data acquired from literature review and Bhutan green energy are presented in this chapter. The analysis focuses on the role of stakeholders, public finance, private sector role, green finance instruments and overall approaches for renewable energy financing in Bhutan.

This chapter assesses the alignment of stakeholders' perspectives with Bhutan's renewable energy goals by comparing the survey findings with existing policies and regulatory frameworks within the kingdom. Additional analyses might require contextualizing these findings within the national regulatory landscape and will involve the introduction of policies such as Bhutan's Renewable Energy Master Plan, hydropower development guidelines, and green finance initiatives.

The findings are categorized into thematic sections mirroring the organization of the survey. Each section presents quantitative and qualitative findings with comparative analysis to relevant policy frameworks. With the aim to provide an overview of the status of renewable energy financing, the concept not only presents the current landscape of renewable energy finance in Bhutan, but also highlights the gaps identified, with challenges and opportunities that will allow the financing system to evolve positively. Analysis of perspectives from key stakeholders and comparison with similar policies from other countries allows us to gather a better understanding of the nexus of energy finance and renewable energy investments in Bhutan.

4.1 Stakeholder Roles and Practices

4.1.1 Findings

The survey revealed the diverse roles stakeholders play in Bhutan's renewable energy sector. Among the 15 participants, the majority represented government agencies (40%), followed by private sector representatives (30%), NGOs/international organizations (20%), and the general public (10%). Regarding their primary role, 35% of participants identified policy-making as their main contribution, while 30% were involved in project implementation, 25% in investment/finance, and 10% in general awareness or interest.

Participants were asked about their level of involvement in renewable energy financing activities:

- 50% reported being actively involved.
- 30% indicated occasional involvement.
- 15% were aware but not directly involved.
- 5% had no involvement.

Familiarity with renewable energy financing was high among participants, with 60% reporting they were very familiar, 30% somewhat familiar, and 10% not very familiar. Notably, collaboration among stakeholders was seen as moderately effective, with 40% agreeing and 20% strongly agreeing, while 30% disagreed and 10% strongly disagreed.

4.1.2 Comparative Analysis with Bhutan's Policies

Bhutan's renewable energy framework is built upon the principles of collaboration and stakeholder involvement, as outlined in the Renewable Energy Policy of 2013 and the Hydropower Development Policy. These policies emphasize the importance of coordinated action among government bodies, private sector entities, and international organizations to achieve the country's renewable energy goals. However, the survey findings suggest that while policies exist to promote collaboration, their practical implementation faces challenges.

The survey's insights reveal a gap between policy objectives and on-ground realities, particularly in terms of the private sector's involvement. Bhutan's energy sector remains heavily reliant on hydropower, largely funded and managed by government entities, which aligns with the dominant representation of government stakeholders in the survey. For instance, there are no shortage of reports from private sector participants that having to continue to align with government-led initiatives and commitments is a challenge and the complexity of the regulatory landscape means there are insufficient incentives for deeper engagement. Furthermore, while NGO and community engagement is acknowledged in policy frameworks, it seems to be less practiced, with the survey findings having comparatively less representation for these groups.

The disconnect between policy intent and execution is further emphasized by the 40 percent of participants disagreeing or strongly disagreeing that their sector worked effectively with others. The Department of Renewable Energy (2020) reports state that, scattered developers with limited

coordination and ambiguous description of roles in the development process are obstacles to the wider implementation of RENEW (Rooftop Solar) in residential buildings. Addressing these gaps will require an overhaul of implementation mechanisms and the need to create platforms for more inclusive dialogue between all stakeholders, in particular to better cocreate private sector innovative solutions anchored in community insights.

4.1.3 Key Insights

The findings reveal that Bhutan's renewable energy policies acknowledge the necessity of stakeholder engagement, yet their operational counterparts do not realize the broader vision of inclusion and associated coordination. However, this area is mainly occupied by government entities — and the participation of private entities in this area is limited, even though it could incentivize innovation and efficiency. The limited stakeholder collaboration is probably due to a mixture of regulatory barriers, lack of structured public-private dialogue and a lack of incentives for private investment.

In practice, moreover, the intent of the policies to engage NGOs and community organizations in the development of renewable energy seems underdeveloped. There are, of course, several areas which will require further attention — for example, policies such as the Renewable Energy Policy of 2013 envisaged aggressive multi-stakeholder partnerships but the low participation of these groups highlights the need for more targeted outreach and capacity-building efforts. Enhancing effective collaboration can happen by strengthening mechanisms such as public-private partnerships (PPPs), providing more clarity for regulatory guidance, and building trust between stakeholders. This would not only be in line with Bhutan's renewable energy aspirations but also create the opportunity for each stakeholder group to leverage its strengths to overcome funding, technical, and implementation challenges. The key to unlocking Bhutan's great potential for harnessing renewable energy rests in creating the link between policy frameworks and their profound operationalization.

4.2 Public Funding

4.2.1 Findings

Public funding plays a significant role in Bhutan's renewable energy sector, as highlighted by survey participants. When asked about the significance of public funding, 60% of respondents rated it as very significant, while 30% considered it significant, and 10% found it insignificant. However, perceptions of sufficiency were less optimistic, with only 20% of participants indicating that public funds were very sufficient, 40% deeming them somewhat sufficient, and 40% labeling them insufficient.

The survey also examined the timeliness of public fund disbursement. Responses showed that only 10% of participants believed funds were always disbursed on time, while 40% said they were sometimes on time, 30% reported rare timeliness, and 20% stated that funds were never on time. Regarding rural areas, 30% of respondents felt public funding addressed renewable energy needs very well, 40% said it did well, 20% rated it poorly, and 10% believed it did not address needs at all.

Participants identified bureaucratic delays (50%) and insufficient funds (30%) as the primary challenges in utilizing public funds effectively, followed by lack of expertise (10%) and other factors (10%).

4.2.2 Comparative Analysis with Bhutan's Policies

Public funding in Bhutan is primarily governed by the Renewable Energy Policy of 2013 and related initiatives targeting the expansion of hydropower and other renewable energy sources. These policies emphasize the allocation of public funds to rural electrification and the development of small-scale renewable projects. However, survey findings suggest gaps in the operational effectiveness of these policies, particularly in the areas of fund sufficiency and timeliness.

The focus on public financing reflected in the survey responses mirrors Bhutan's dependence on hydropower as the foundation of its energy strategy. However, public funding has been instrumental in achieving universal access to electricity, not so much when it comes to broadening the energy mix. This corresponds with critiques from policy analyses, which finds that public funds largely flow through large-scale hydropower and often to the exclusion of other renewables, like solar and wind, which is associated with a low level of funding (ADB, 2020).

And while the late handing out of forms is a problem nearly everyone who attended mentioned, it is also a symptom of a deeper rot in fund management and bureaucracy. There can be delays under this process, which they can use to extend the time it takes to ensure that renewable energy projects, in particular, are built in a timely manner in remote areas where infrastructure exists but challenges with moving people and equipment least. While Bhutanese policies promote access to energy sources, survey responses indicated that more could be done to address its rural areas.

4.2.3 Key Insights

Although public funding remains a very important factor in the renewable energy growth and development of Bhutan, its effectiveness is hampered by a range of operational difficulties. While policies have recognized the need for public funding, disbursement has been inadequate and delayed, indicating a gulf between policy objective and policy implementation. Such solutions are particularly needed in rural areas, which lack renewable energy solutions.

Closing these gaps will require a multi-pronged approach. These include simplifying bureaucratic procedures for timely distribution, enhancing budgetary allocations for underfunded renewable sectors, and instituting greater accountability over the use of funds. Plus, strengthening the capacity of local systems to design, deploy and manage funds has immense potential to accelerate energy access in rural economies. In a first step, the public funding policies need to be fine-tuned to be consistent with the overall energy goal of Bhutan, but also ensure a clear responsibility and accountability mechanism that both helps to ensure progress and equitable use of resources.

4.3 Private Sector Involvement

4.3.1 Findings

The survey revealed differing opinions on the role of the private sector in Bhutan's renewable energy investments. Asked how interested the private sector was in renewable energy, 40% said it was very interested, 30% said it was somewhat interested, while 30% said the private sector had limited interest in renewable energy.

The survey revealed four key barriers to investment from the private sector, with high costs (40%) coming in as the top barrier followed by regulatory challenges (30%) Lack of incentives (20%) and limited market demand (10%) were other challenges. Only 10% rated Bhutan's policies for

private renewable energy investors as very attractive, while 50% reported that they were somewhat attractive, 30% that they were not very attractive, and 10% that they were not attractive at all.

Asked whether, in the drops of the Big Band's orbit, the pen and the bill could replace the dollar, 20% strongly agreed that there were enough incentives, such as subsidies or tax breaks to get the band rolling (40% agreed, 30% disagreed and 10% strongly disagreed). More than half of those polled rated public-private partnerships (PPPs) as somewhat effective and 20 percent as very effective, while 20 percent said that they were not very effective and 10 percent were not effective.

4.3.2 Comparative Analysis with Bhutan's Policies

The 2013 Renewable Energy Policy and other regulatory frameworks in Bhutan both recognize that the private sector plays a vital role in realizing the energy objectives of the country. Tax exemptions, low-interest loans and encouraging public-private partnerships are among the policies designed to draw private investment. But the survey results suggest that the recognition is not yet reflected in the solutions available to business to address the challenges they face.

As noted by participants, one major obstacle is the high operating cost of renewable energy projects. Although Bhutan lists certain tax exemptions and financial incentives, they may not alleviate the initial capital expenditure needed for solar and wind (non-hydro) projects in a timely manner. Regulatory hurdles also emerged as a major barrier, highlighting the need for clearer and more investor-friendly policy frameworks. For example, respondents noted that the existing protocol for permits/approvals is lengthy and cumbersome, driving away potential investors.

Public-private partnerships (PPPs), another area, demonstrates that there is room to learn from Bhutan's policies and practices. However, while policies prioritise PPPs as a way to mobilize resources and share risk, survey findings show their implementation has been at best moderately effective. There are few avenues by which the government can engage in dialogue with the private sector, or no clear roles and expectations for both parties are delineated in the PPP agreements.

4.3.3 Key Insights

Despite the policy provisions that aim to drive private investment in Bhutan's renewable energy sector, high project costs, regulatory complexities and lack of adequate incentives hampers private sector engagement in the sector. Though the Renewable Energy Policy 2013 contains a pragmatic

set of incentives to draw private investors, it has had limited efficacy as seen in the moderate and below ratings from our survey participants.

This requires Bhutan to adopt a more proactive approach in facilitating private sector participation and this could be achieved through effective regulatory containment, increased availability of risk-mitigation instruments (i.e., guarantees) and expansion of financial incentives providing targeted subsidies or grants for solar, wind and other emerging renewable technologies. Also enhancing the framework outlining public-private partnerships by embedding clear communication, fair risk-sharing, and transparency in decision making would provide structure and create high trust collaboration. Tackling these barriers will be critical for harnessing private sector innovation and financing to diversify Bhutan's renewable energy mix and achieve its ambitious energy objectives.

4.4 Green Financial Tools

4.4.1 Findings

The survey explored stakeholders' familiarity with and perceptions of green financial tools such as green bonds and carbon markets. Among participants, 50% were somewhat familiar with these tools, 30% were very familiar, and 20% reported limited familiarity. Despite this familiarity, only 20% of respondents considered green bonds very effective in financing renewable energy projects, 50% rated them as somewhat effective, and 30% deemed them not very effective.

Accessibility of green financial tools for Bhutanese stakeholders was another key focus. Responses indicated that only 10% of participants believed these tools were very accessible, while 40% found them somewhat accessible, 30% said they were not very accessible, and 20% considered them not accessible at all. Regarding Bhutan's readiness to participate in international carbon markets, 30% believed Bhutan was somewhat prepared, while 50% thought it was not prepared, and 20% were uncertain.

Participants identified limited awareness (40%), lack of infrastructure (30%), and policy gaps (20%) as the main challenges in leveraging green financial tools. Additionally, 60% of respondents felt that these tools only moderately reduced financial risks for renewable energy projects, while 30% rated them poorly in this regard, and 10% thought they were highly effective.

4.4.2 Comparative Analysis with Bhutan's Policies

Bhutan's energy directives and environmental policies illustrate how green financial mechanisms can augment sustainable energy progress. Nonetheless, the actual recycling is largely unpracticed. For example, Bhutan plans to conduct a feasibility study to explore green bond issuance as a financing mechanism for renewable energy projects, but it has not yet built the necessary framework to issue or manage green bonds. Likewise, while Bhutan has the necessary prerequisites for participating in international carbon markets, institutional capacity and infrastructure have limited market development.

Bhutan's Renewable Energy Policy initiated in 2013 along with its commitments under the Paris Agreement stresses the need for innovative financial mechanisms to draw investments. But reported survey responses indicate this policy ambition has not translated into real-world measures. Stakeholders reported that the limited accessibility of green financial tools indicates a gap in capacity-building initiatives and awareness programs. And while Bhutan's hydropower-dominated focus complements its renewable energy strategy, diversifying its sources of financing with green financial instruments could speed investments in solar, wind and other technologies.

Policy gaps emerged as a cross-cutting theme in the survey results, calling for clearer guidelines on the adoption and regulation of green financial tools. Bhutan's status as a carbon-negative country presents a compelling case to access global carbon markets, but the 50% of participants feeling unprepared suggests an opportunity not yet realized.

4.4.3 Key Insights

Green financial instruments still offer potential in Bhutan and could play a bigger role in financing renewable energy. Stakeholders have a reasonable familiarity with these tools but face many barriers, particularly in awareness, infrastructure, and policy gaps. Although policies in Bhutan recognize the role of green finance, action on the ground is at an early stage, evidenced by a lack of accessibility, and preparatory work, to engage in international carbon markets.

Bhutan has the potential to tap into green financial tools, but needs a structured institutional and regulatory ecosystem. This is through systems built around the issuance of green bonds, the participation in a carbon market, and training stakeholders. Moreover, their incorporation into existing renewable energy strategies has the potential to minimize financial risks and attract

international investments. Overcoming these challenges would allow Bhutan to diversify its sources of financing while maintaining its renewable energy development trajectory through a stronger green finance ecosystem.

4.5 General Perceptions

4.5.1 Findings

Survey questions asked about general perceptions of renewable energy financing in Bhutan. When asked which renewable energy source they believe is most promising for the country, 70% selected hydropower, 20% solar energy, and 10% wind energy. There were NO respondents who cited biomass as an option with promise.

When asked about the top challenge in financing renewable energy projects, 40% of respondents said high costs, 30% said policy issues, 20% said a lack of funding and 10% said technical barriers. These challenges reflect a confluence of economic, regulatory, and technological constraints inhibiting renewable energy financing.

Respondents were generally optimistic about the potential of energy finance mechanisms to help Bhutan meet its renewable energy goals, with 30% strongly agreeing and 50% agreeing. However, 20% expressed disagreement, indicating some skepticism about the adequacy of current mechanisms. When asked to rate the current level of investment in Bhutan's renewable energy sector, 40% described it as low, 30% as very low, 20% as high, and 10% as very high.

Stakeholder involvement was deemed crucial by the majority of respondents, with 60% considering it very important, 30% important, and 10% somewhat important for ensuring the success of renewable energy financing initiatives.

4.5.2 Comparative Analysis with Bhutan's Policies

Bhutan's renewable energy policies, particularly the Renewable Energy Policy of 2013, strongly advocate for stakeholder collaboration and diversified renewable energy investments. Hydropower has long been the dominant focus of Bhutan's energy strategy, and the survey findings reaffirm its perceived primacy among stakeholders. However, while hydropower continues to provide economic benefits and energy security, Bhutan's heavy reliance on this single source presents risks,

including vulnerability to climate variability and geopolitical considerations related to cross-border electricity exports.

Under the Policy Documents, there is an emphasis on differentiated investments in solar, wind, and other forms of technology to diversify the type of renewable energy. Survey findings on this diversification reveal little immediate optimism, however, with an overwhelming preference for hydropower activity persisting. Policy inefficiencies and cost are additional barriers to diversification. These barriers are acknowledged in Bhutan's existing policies, which include measures like subsidies and incentives meant to mitigate financial risks; however, stakeholders' responses suggest that the effectiveness of their implementation has been limited.

With respect to stakeholder involvement, Bhutan's policies highlight participatory approaches at all levels—from various government agencies to private investors and local communities. Although the survey findings underscore the perceived significance of such engagement, the mixed ratings regarding the degree of current investment indicates that there are inadequacies in fostering the requisite collaboration and mobilization of resources. Finally, the relatively high levels of skepticism about the adequacy of existing energy finance mechanisms highlight the need for policy adjustments to instill greater confidence among stakeholders and encourage participation.

4.5.3 Key Insights

Stakeholder responses provide mixed signals regarding Bhutan's renewable energy financing ecosystem, indicating perceived strengths as well as areas that warrant attention. Hydropower continues to form the backbone of Bhutan's renewable energy strategy, closely aligned with national policies. But the narrow focus on other renewables like solar and wind reveals a major policy and investment gap, especially as stakeholders identified high costs and regulatory issues as key challenges.

Policy tools designed to promote diversification and mitigate financial risks seem to need further strengthening to properly respond to stakeholder concerns. Moreover, although stakeholder engagement has been cited as critical for success of a financial mechanism, the perceptions of stakeholders regarding investments in present initiatives have mixed perceptions and increasing skepticism regarding finance mechanisms indicate a need for more comprehensive and transparent

frameworks. Bhutan needs to focus on diversifying initiatives, reinforcing the enforcement of policies, and building the trust of stakeholders in the system and facilitators of energy transition by creating an enabling environment, in order to align perceptions at the identity and culture with national objectives for renewable energy.

4.6 Key Insights Summary

These findings and analysis are important in terms of demonstrating the contribution of energy finance on supporting renewable energy investment in Bhutan. Insights based on stakeholder feedback and comparison of their feedback with Bhutan's existing policies underscoring strengths, challenges, and opportunities for the renewable energy sector of Bhutan.

1. Stakeholder Roles and Practices

While the Bhutanese renewable energy policies highlight stakeholder collaboration, the study reveals that it is not implemented in practice. The sector is mainly led by government actors, with a lacking involvement of the private sector and the NGO. This lack of diversity is symptomatic of an imbalance that highlights the need for more inclusive systems that attract a wider variety of actors such as private investors and civil society organizations.” More cross-sector coordination and communication could close those gaps and better align efforts to national energy goals.

2. Public Funding

Public financial support continues to play a significant role in Bhutan's renewables subsectors, most notably for hydropower and rural electrification. And yet, survey respondents reported that there are obstacles such as lack of funding, delayed disbursement, and little emphasis on diversification despite its importance. These results suggest a call to reform of fund managements and targeted efforts in underinvested sources of renewable energy like solar and wind to supplement Bhutan's hydropower-heavy economy.

3. Private Sector Involvement

Private sector participation is limited to expensive costs, regulatory challenges and low incentives. Despite Bhutan's policies supporting the private sector, implementation has not adequately addressed these challenges. Clarifying policies, streamlining regulatory

processes, and incorporating risk-mitigation instruments like guarantees or grants could induce greater private sector participation while assisting the diversification of Bhutan's renewable energy mix.

4. Green Financial Tools

Financial tools (green bonds, carbon markets – more on this below) have been untapped. Although stakeholders have some knowledge of these tools, their adoption is hampered by limited accessibility, a lack of infrastructure, and policy gaps. Bhutan's carbon-negative status renders it uniquely placed to capitalize on international carbon markets, yet ambitious upscaling of capacity-building and technical support are required to make a reality of this potential. The establishment of frameworks for the issuance of green bonds and the incorporation of these instruments into national renewable energy strategies could pave the way.

5. General Perceptions

Hydropower continues to be a pillar sector in Bhutan's renewable energy development strategy, and the results reflect its predominance in both demand and stakeholder priorities. But the narrow interest to others renewable sources and doubt about current financing mechanisms' sufficiency indicate an energy diversification gap. Tackling high costs, policy inefficiencies, and technical barriers will be essential for progressing Bhutan's renewable energy ambitions. While stakeholders understand the need for collaboration and investment, they see mixed results from current efforts and see a need for stronger alignment between policy intentions and implementation.

4.7 Conclusion

In summary, the results and analysis discussed in this chapter contribute to a better understanding of the role of energy finance in supporting renewable energy investments in Bhutan. Utilizing a blend of survey responses and comparative ratios with Bhutan's current policy, this chapter outlines both the successes and difficulties the country faces in terms of sustainable energy development.

The key findings highlight the importance of hydropower in Bhutan's renewable energy matrix, whilst capturing the lack of utilization of other renewable sources, such as solar and wind. Public

funding is a key source of support for renewable energy projects, but it can only be effective to the extent that it is not inadequate, delayed or concentrated. The need for private sector participation is widely acknowledged, but the obstacles — including cost, regulatory burdens and inadequate incentives — can become significant. Nevertheless, many green financial tools are unavailable or only partially available because of factors such as accessibility and political implementation gap.

Overall, stakeholders are optimistic about Bhutan's renewable energy in terms of vision; however, they view existing financing mechanisms as insufficient. These mixed sentiments further emphasize the need for improved policy enforcement, greater collaboration among stakeholders, and directed investments to address high costs, regulatory challenges, and technical barriers.

The analysis maintains that while Bhutan's policies provide a strong foundation for renewable energy development, their operationalization would need refinement to match stakeholder's expectation and viable opportunities in the emerging global environment. Enabling factors such as working on public-private partnerships, the diversification of funding mechanisms, and tapping into Bhutan's carbon-negative status through international green finance instruments/cross-border power purchase arrangements are likely to boost the hydropower sector significantly.

These recommendations are intended to address those challenges and leverage Bhutan's unique opportunities to achieve its renewable energy potential in an environmentally sustainable manner, and this chapter gives context to those recommendations.

4.8 Recommendations

In line with the opportunities and challenges identified above in the context of Bhutan's renewable energy financing landscape, a number of actionable recommendations are proposed to address these issues. The recommendations would increase energy finance mechanism efficiency, promote stakeholders' collaboration, and fast-track Bhutan's renewable energy ambitions.

One area of possible improvements could be in stakeholder collaboration. A platform that incorporates government, private investors, NGOs, and community representatives can serve as a formal mechanism for dialogue and alignment. A platform of this nature can assist in bridging coordination gaps and ensuring everyone has a say when decisions are being made. In addition, public-private partnerships (PPPs) can help: clear up what risks they bear by establishing

guidelines for risk-sharing; establish clear roles and responsibilities; and make sure approval and oversight processes are efficient and scalable.

Equally important is improving the efficiency of public funding. Bureaucratic delays must be mitigated for timely disbursement of funds to be possible — especially in rural areas where delays have far reaching consequences. A portion of public funding needs to go towards underfunded renewable energy technologies such as solar and wind, as this will diversify Bhutan's energy portfolio. Enhancement of monitoring and reporting frameworks should ensure transparency and accountability on public fund utilization, aligning with national renewable energy goals."

We must proactively create a better environment for the private sector to contribute, removing regulations inhibiting their participation and increasing financial incentives. Often, complex permitting and approval processes hinder private investors, but together, these would standardize practices in the renewable energy sector. Impartial and specialized financial incentives like reimbursements, tax cuts and low-investment advances should be generated to back the improvement of new sustainable innovations and little scale developments. In addition, risk mitigation instruments like loan guarantees or insurance schemes can help minimize financial risks associated with private investments, encouraging greater confidence and participation in the sector.

The use of green financial instruments is an area of great potential for Bhutan. Setting up a regulatory and institutional framework can galvanize global and local investments into renewable energy projects. Bhutan's distinctive carbon-negative status gives it a solid foundation for participation in international carbon markets, but there is need for some capacity-building efforts to be ready. These initiatives may allow raising awareness of green financial instruments among stakeholders and their uptake and use.

Diversity is the key to energy security and sustainability, especially in our case with renewables. There is evidence that targeted programs that provide incentives for investments in solar and wind energy can help overcome technical and financial barriers that are specific to these technologies. Grants and technical assistance for community-based and decentralized renewable energy projects will enhance energy access in rural areas. Linking renewable energy financing mechanisms to Bhutan's wider climate change commitments made domestically and internationally through the Paris Agreement should reinforce energy ambitions with global environmental agendas.

Lastly, strengthening the implementation of an existing policy is crucial to enable progress in a practical way. Regular evaluations of renewable energy policies will provide insights for identifying gaps, measuring progress, and addressing emerging challenges. This requires strengthening the independence and capacity of regulatory bodies so they can carry out policies effectively. Collaboration with international organizations and donor agencies can be instrumental in offering technical assistance and funding for breakthrough renewable energy initiatives and green financing instruments, strengthening Bhutan's renewable energy industry.

The adoption of these recommendations would help Bhutan overcome its immediate challenges and lựa chọn to capitalize on the potential of renewable energy nguồn and become a leader in sustainable energy development. It is only through a concerted approach from all stakeholders with the resolve to harness the unique strengths and opportunities that Bhutan possesses within the international green energy context that we can do justice to the aspirational energy policy and avoid the pitfalls of passion-driven policies going forward.

Chapter 5: Conclusion

5.0 Introduction

This chapter serves as a detailed conclusion to the research, summarizing the main findings, contributions, and implications of the study. The chapter discusses the research aims and importance of the research to the renewable energy finance research domain and it also notes the limitations of the study. This chapter also presents recommendations for future research and concluding remarks to highlight the broader implications of the study.

5.1 Summary of Key Findings

The study investigated how energy finance can support investments in renewable energy in Bhutan by examining stakeholder practices, the role of public and private funding, the relationship between green financial tools and renewable energy investment and general perspectives on the usefulness of energy finance. The key findings indicated that hydropower remained the predominant source of renewable energy generation in Bhutan with substantial public financing and thrust from the government. The study did mention hurdles to diversification and participation from the private sector, regulatory difficulties, and lack of the necessary adoption of green financial instruments. Stakeholders were optimistic about the potential of energy finance mechanisms but highlighted how collaboration, policies needing to align, and an increase in investment need to be made into neglected, less invested technologies including solar and wind.

5.2 Contributions to Knowledge

In summary, this study enhances the knowledge on both academia and practice on renewable energy financing in Bhutan. It documents stakeholder perspectives with empirical evidence and highlights significant gaps in policy implementation and financing mechanisms. Insights about the underutilization of green financial tools and challenges as seen by private sector investors are also provided by the study. The findings of this research will be useful for policymakers, researchers, and practitioners in enhancing the renewable energy financing framework in Bhutan and elsewhere.

5.3 Implications

The results could have broader consequences for the renewable energy field in Bhutan. For Policymakers, the study provides evidence for policymakers of the need for diversification of energy investments, better efficiency of public funds, and the creation of an enabling environment for private sector participation in energy investments. For the stakeholders, the study suggests building partnerships and developing capacity-development initiatives to harness green financial tools effectively. International organizations and donors can utilize these insights to customize technical and financial assistance to Bhutan's renewable energy ambitions.

5.4 Limitations

Although the study provides important information, it has limitations. That said, while 15 participants are an adequate number for qualitative analysis, this sample may not represent all perspectives found in Bhutan's renewable energy sector. This study largely relied on self-reported data, which can add a risk of bias, and the place of focus in the context of Bhutan limits the range of applicability of the results for other areas. Furthermore, the study focused on stakeholder perceptions and did not provide detailed economic or technical assessments of renewable energy projects.

5.5 Future Research Directions

Future studies could encompass a larger population, as well as include a broader spectrum of stakeholders, including investors operating across international boundaries and bottom-up organizations. Such longitudinal studies could shed more light on the changing relationship of renewable energy financing in Bhutan. Research on economic feasibility and technical viability of underexploited renewable energy sources for example, solar and wind, would add to the conclusions of this work. Additionally, assessing Bhutan's preparedness to implement advanced green financial instruments and engage in international carbon markets could generate actionable recommendations for scaling up investment.

5.6 Concluding Remarks

The study highlights the importance of energy finance when working to support renewable energy and sustainable development goals in Bhutan. That it as such, Bhutan could potentially harness most of its renewable energy potential, so long as it addresses the challenges and implements the proposed recommendations put down. More important, Bhutan could be a pioneer in sustainable energy development. Although previous studies have examined the financing of renewable energy, this study adds to the existing literature on this theme and aims to provide practical results for sustainable development.

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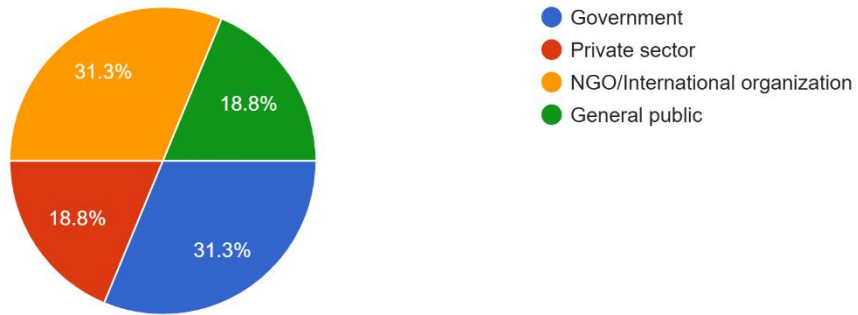
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Appendix. A

Section 1: Respondent Information

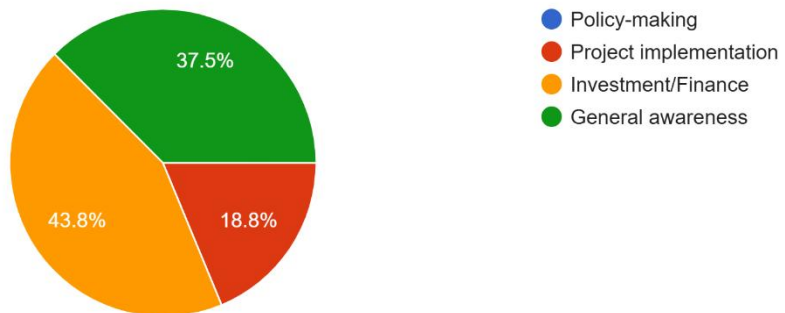
1. Which sector do you represent?

16 responses



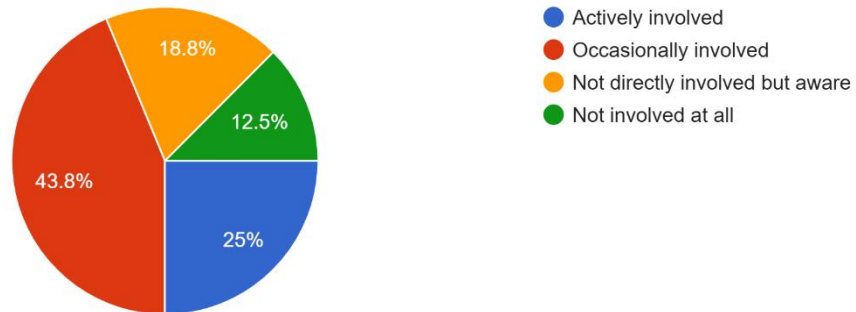
2. What is your primary role related to renewable energy financing?

16 responses



3. How directly are you involved in renewable energy financing activities?

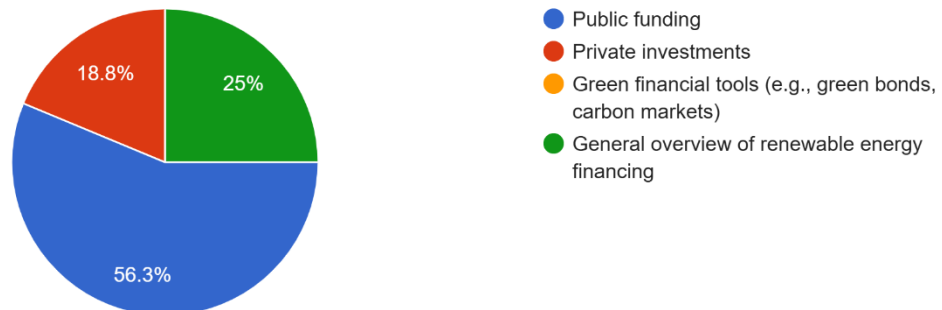
16 responses



Section 2: Stakeholder Views and Practices

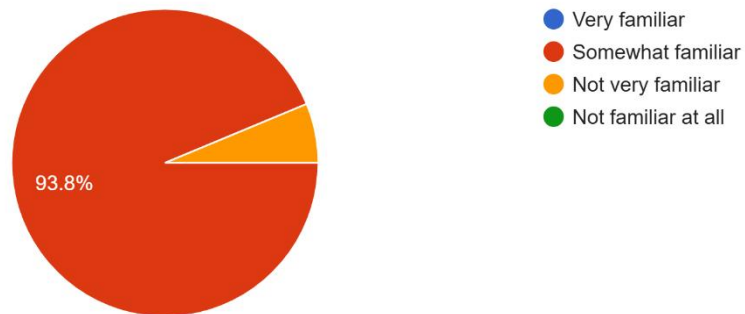
4. Which area of renewable energy financing are you most familiar with

16 responses



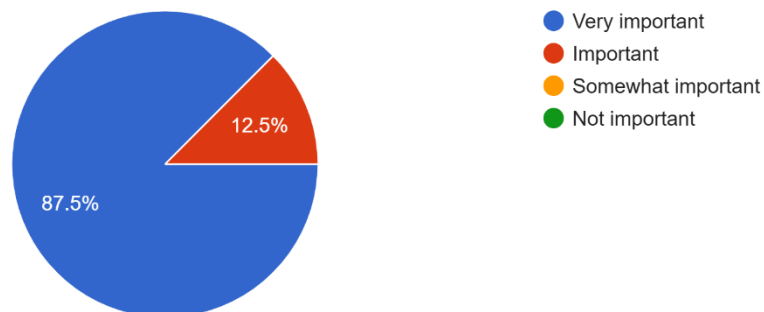
5. How familiar are you with renewable energy financing in Bhutan?

16 responses



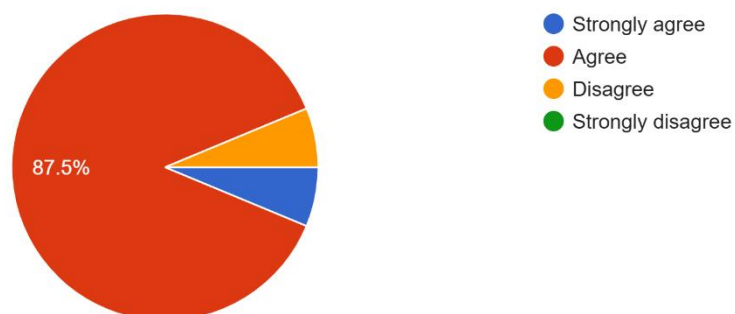
6. How important is renewable energy financing for Bhutan's energy development?

16 responses



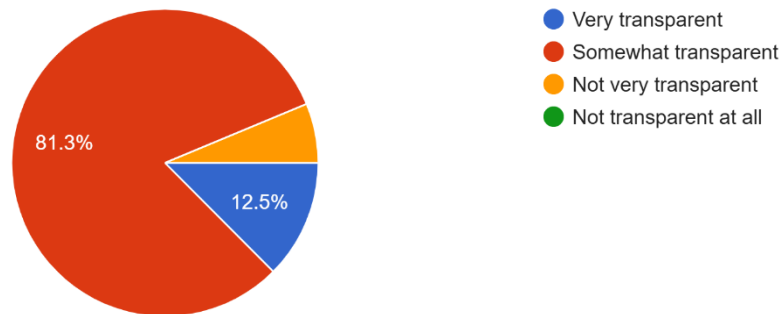
7. Do you believe stakeholders collaborate effectively in renewable energy financing?

16 responses



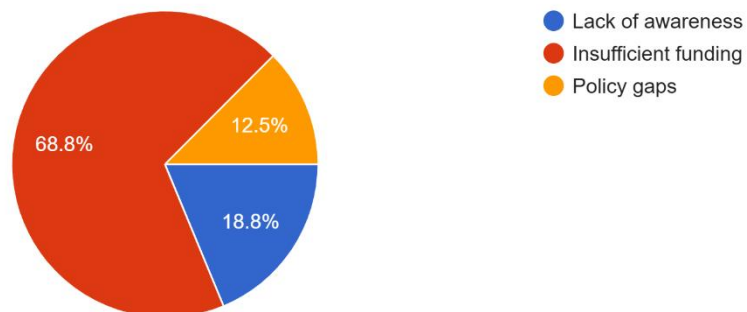
8. How would you rate the transparency of renewable energy financing practices in Bhutan?

16 responses



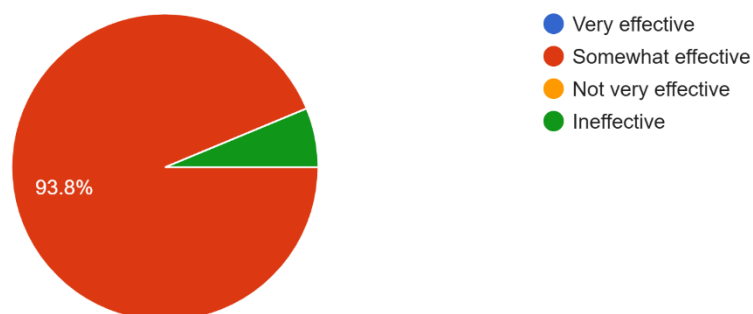
9. What is the biggest barrier to renewable energy financing in Bhutan?

16 responses



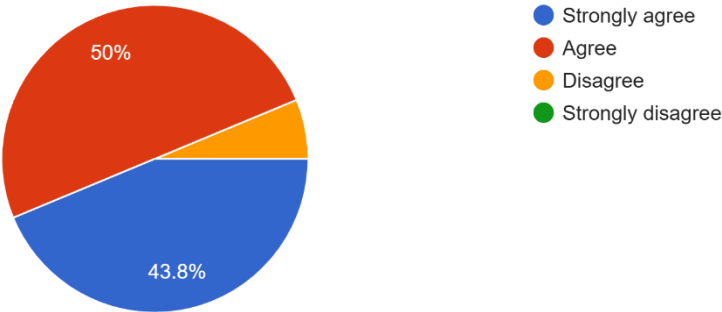
10. How effective are current renewable energy financing practices in promoting investments

16 responses



11. Do you think financing practices align with Bhutan’s renewable energy goals?

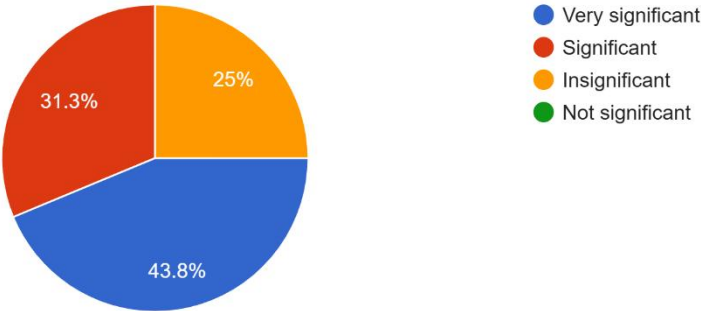
16 responses



Section 3: Public Funding

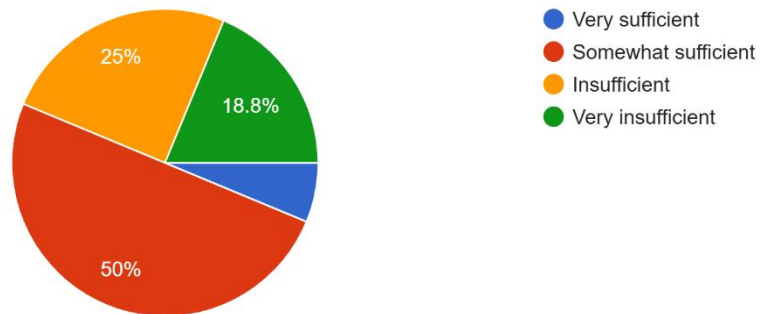
12. How significant is public funding in supporting renewable energy projects?

16 responses



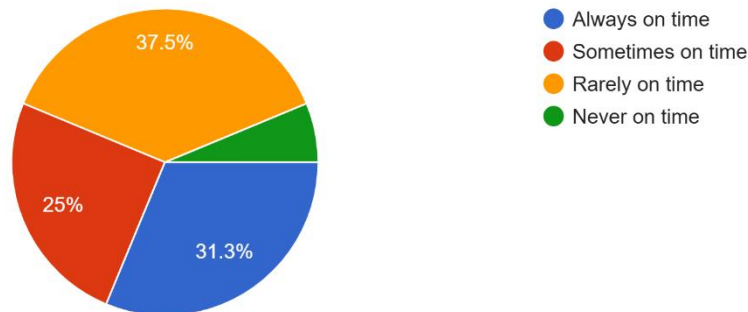
13. How sufficient are public funds to meet Bhutan's renewable energy needs?

16 responses



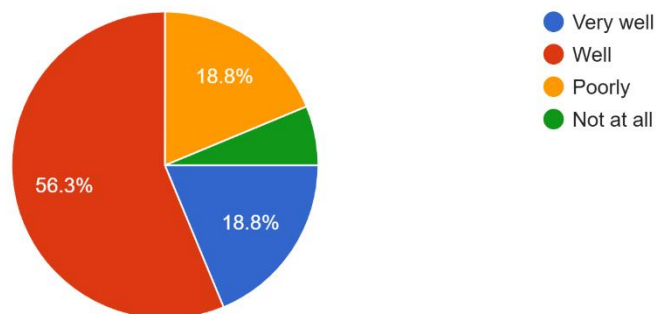
14. How timely is the disbursement of public funds for renewable energy projects?

16 responses



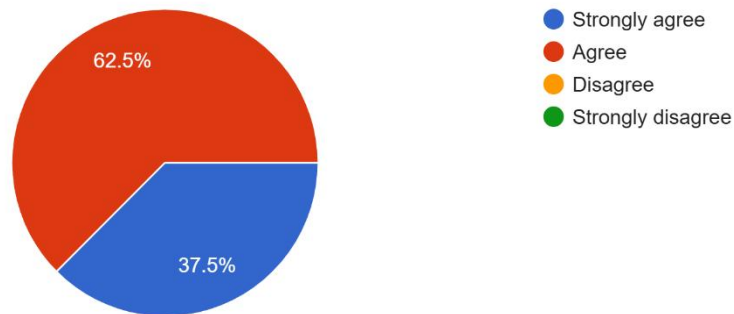
15. How well does public funding address renewable energy needs in rural areas?

16 responses



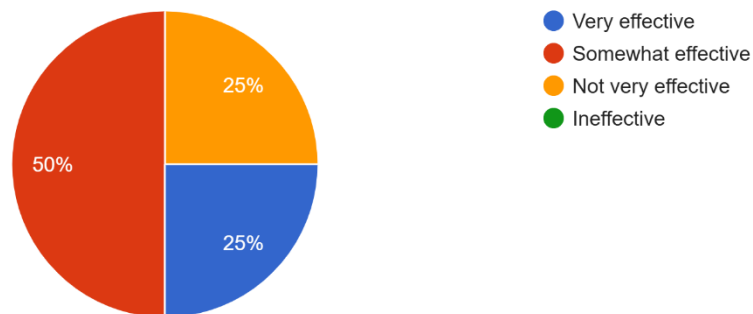
16. Do you believe public funds should prioritize certain renewable energy sources?

16 responses



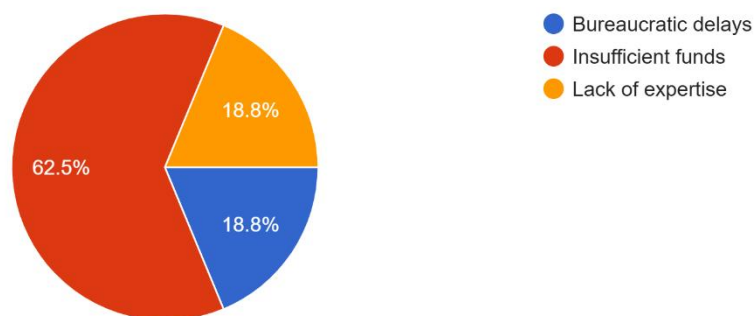
17. How effective are public subsidies and grants in promoting renewable energy projects?

16 responses



18. What is the main challenge in using public funds for renewable energy projects?

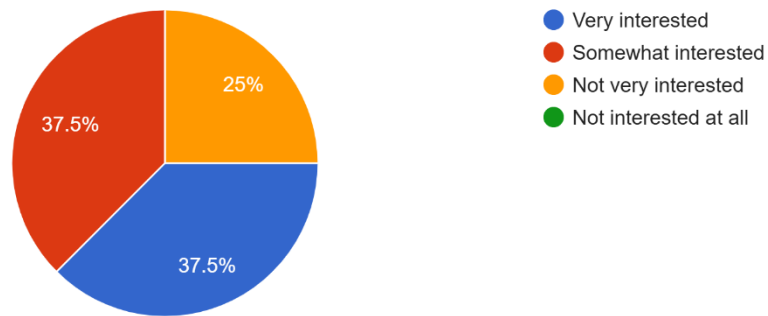
16 responses



Section 4: Private Sector Involvement

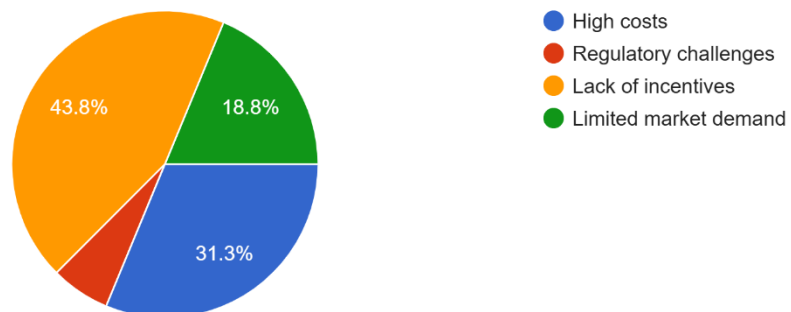
19. How interested is the private sector in renewable energy investments in Bhutan?

16 responses



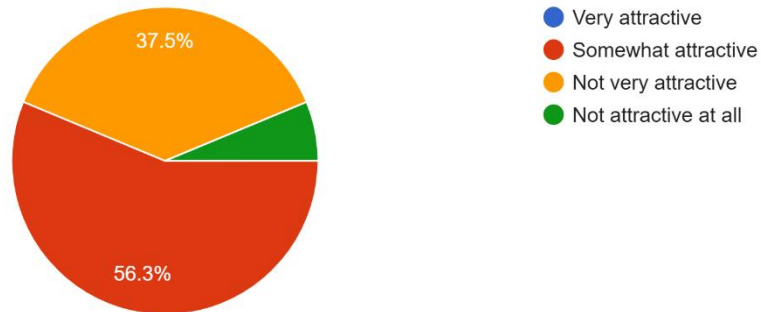
20. What is the biggest barrier for private sector investment in renewable energy

16 responses



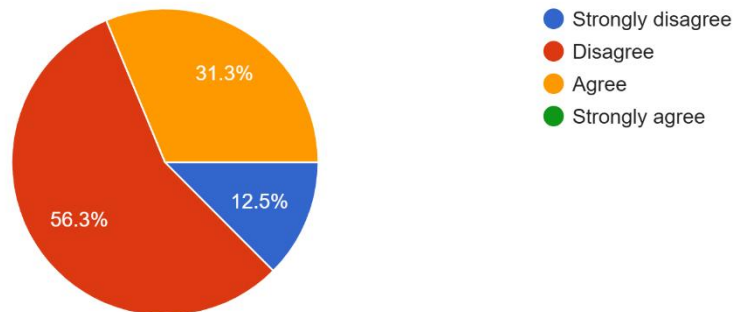
21. How attractive are Bhutan's policies for private renewable energy investors?

16 responses



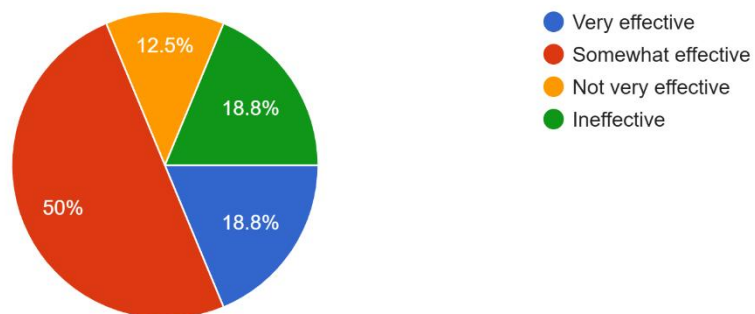
22. Are there enough incentives for private investment in renewable energy in Bhutan?

16 responses

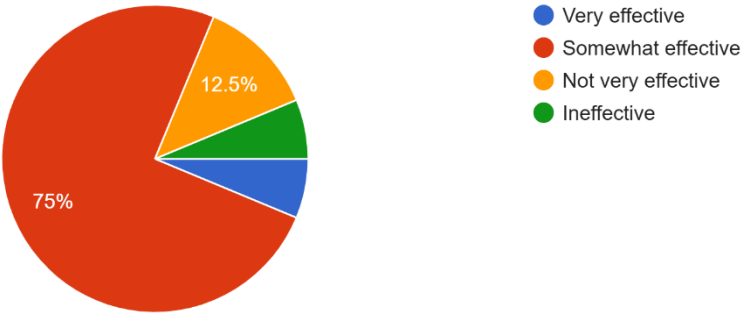


23. How effective are loans in encouraging private sector investment in renewable energy?

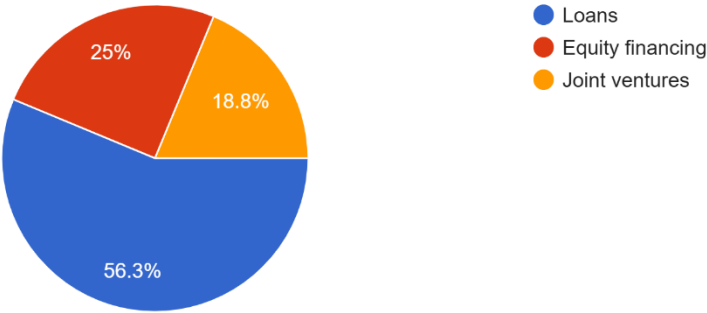
16 responses



24. How effective are public-private partnerships (PPPs) in promoting renewable energy projects?
16 responses



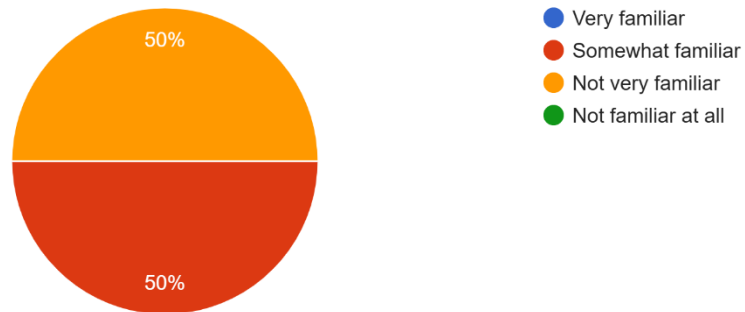
25. What type of private sector funding is most suitable for Bhutan’s renewable energy sector?
16 responses



Section 5: Green Financial Tools

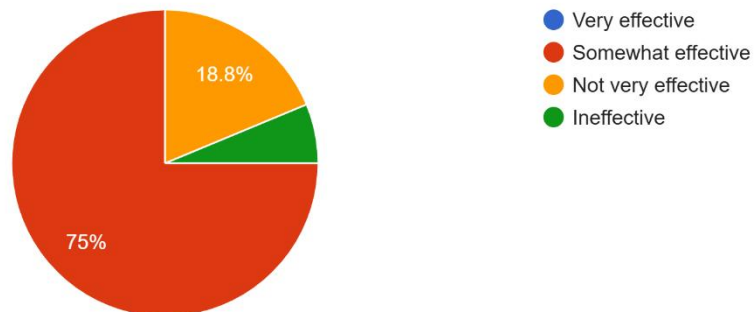
26. How familiar are you with green financial tools like green bonds and carbon markets?

16 responses



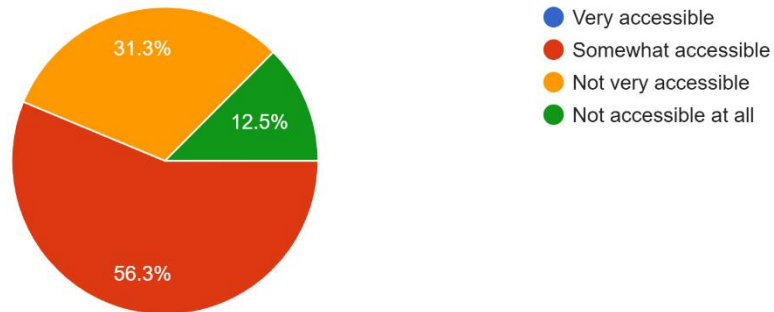
27. How effective are green bonds in financing renewable energy projects?

16 responses



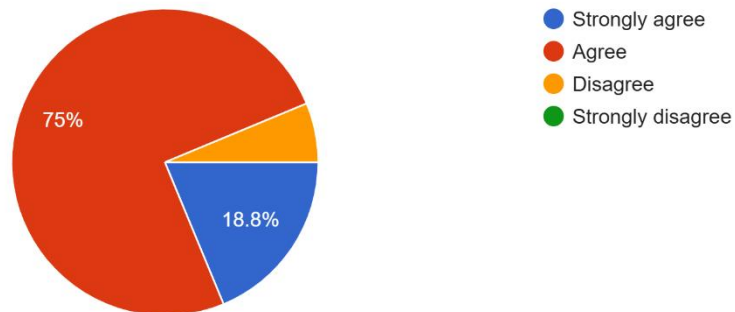
28. How accessible are green bonds for Bhutan's stakeholders?

16 responses



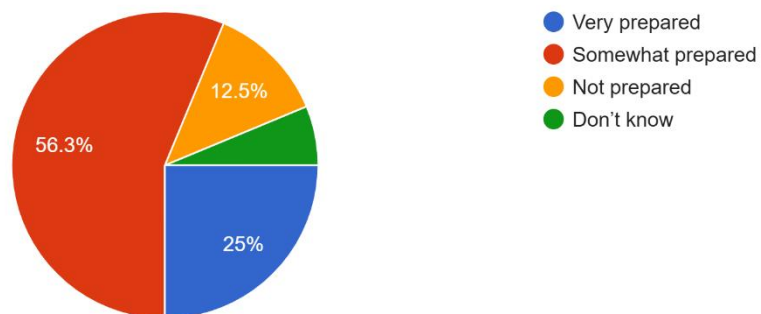
29. Do you believe carbon markets can support Bhutan's renewable energy goals?

16 responses



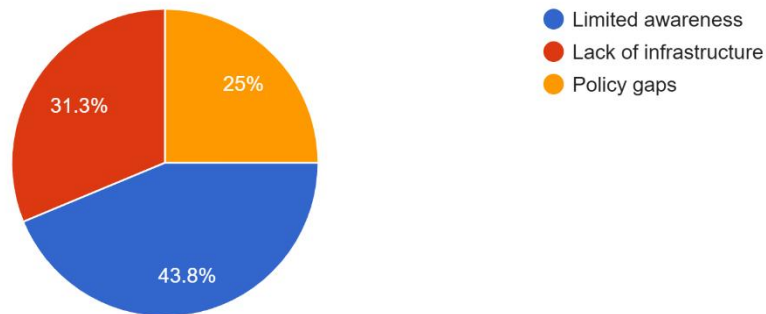
30. How prepared is Bhutan to participate in international carbon markets?

16 responses



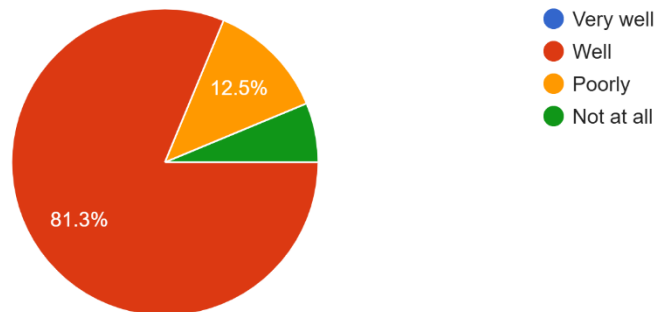
31. What is the biggest challenge in using green financial tools in Bhutan?

16 responses



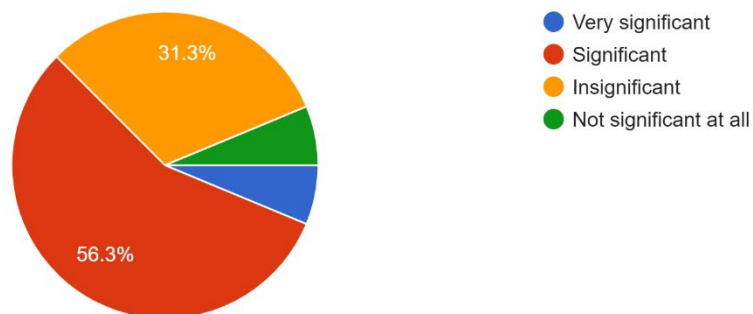
32. How well do green financial tools reduce financial risks for renewable energy projects?

16 responses

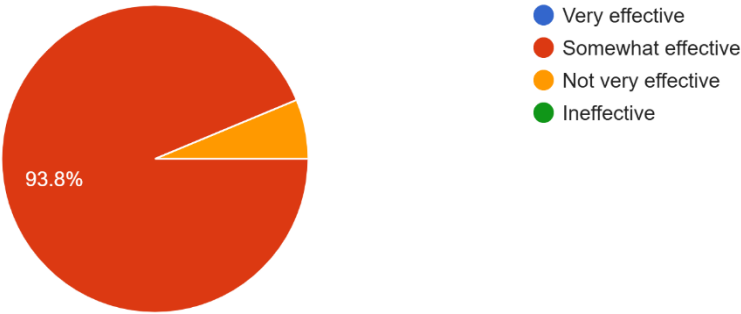


33. How significant is Bhutan's participation in international carbon markets?

16 responses

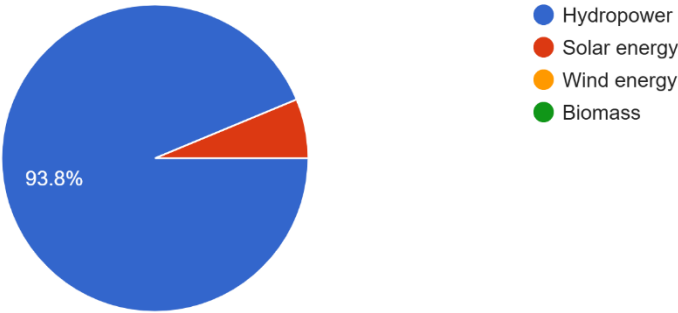


34. How effective are international loans in promoting renewable energy investments in Bhutan?
16 responses



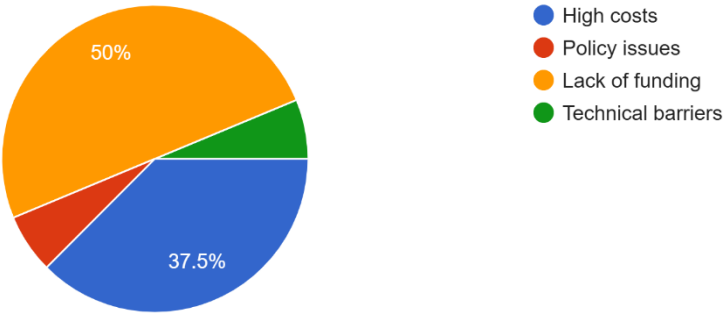
Section 6: General Perceptions

35. What is the most promising renewable energy source for Bhutan?
16 responses



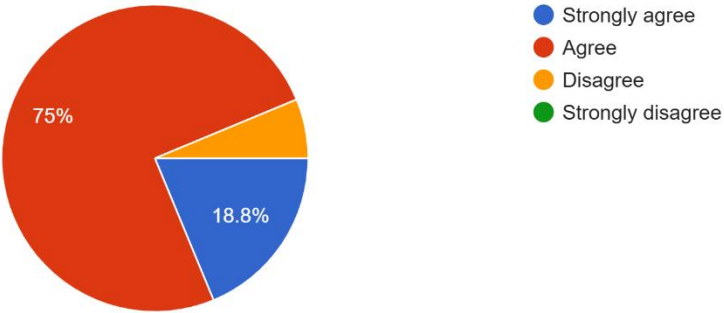
36. What is the biggest challenge in financing renewable energy projects?

16 responses



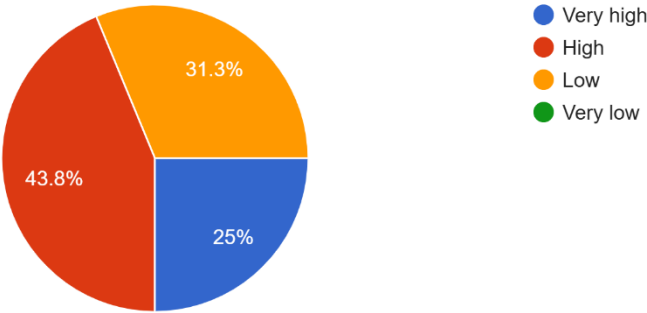
37. Do you think energy finance mechanisms will help Bhutan meet its renewable energy goals

16 responses



38. How would you rate the current level of investment in Bhutan’s renewable energy sector?

16 responses



39. How important is stakeholder involvement in ensuring successful renewable energy financing?
16 responses

