

# Proposing Policy Mechanisms to Reduce Barriers to the Implementation of Renewable Energy Projects in Namibia

**Heike Scholtz**

School of Public Management and Administration, University of Pretoria, South Africa

**Margaret Chitiga-Mabugu**

School of Public Management and Administration, University of Pretoria, South Africa

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## **Abstract**

*To achieve policy goals that address industrialisation and economic growth, modern states depend on the ready access to energy. This poses the question as to what developing countries such as Namibia can do to ensure energy supply, especially by focusing on readily available resources such as wind and the sun. The study firstly identifies the non-technical barriers to the implementation of renewable energy solutions by using a qualitative approach that focuses on in-depth interviews with industry stakeholders. Secondly, based on the identified barriers, mechanisms to enhance the role of renewable energy are suggested based on existing policies, the literature review and the interview responses. Most of the interviewees identified governance issues and policy gaps as the key barriers limiting the development of renewable energy projects in Namibia. This is aligned to international experience as described in literature, where policy gaps are often identified as a major barrier to the implementation of renewable energy. Literature further also showed that often more than one barrier was at play and that, similar to the findings for Namibia, a systems approach needs to be followed. The policy recommendations from the study include a revision of the outdated Energy White Paper and the speedy completion of a renewable energy policy. It is further recommended that policy documents clearly set out the roles and responsibilities of various stakeholders to enable a concerted effort to remove the barriers to renewable energy that are prevalent in Namibia.*

## Introduction

Currently, through its national power utility, the Namibia Power Corporation (NamPower), Namibia imports between 40 and 80 per cent of its electricity demand from various neighbouring countries.<sup>1</sup> The amount imported varies depending on local generation at the Ruacana hydroelectric plant situated on the border between Namibia and Angola. This, in turn, is dependent on the flow in the Kunene River. As a result, the country is exposed to two major risks, namely that the supply is disrupted at the source or that the transmission network fails. This highlights the need for Namibia to enhance its self-sufficiency in terms of electricity supply. Namibia's peak demand and electricity sales are projected to increase to 1 100 MW from 611 MW and 6 500 GWh from 4 254 GWh in 2015 and by the year 2030, respectively.<sup>2</sup> Oertzen makes a strong case for using renewable energy technology, both from a technical and an economic perspective, to overcome the energy supply and demand gaps in Namibia.<sup>3</sup> He further highlights the need for renewable energy to not only curb the looming electricity supply shortage, but also to secure long-term supply.<sup>4</sup>

Yet, amidst all the technological and economic benefits of renewable energy, by the beginning of 2016 only one of the renewable energy companies that obtained a conditional license from the Electricity Control Board (ECB) had managed to install and operate a 5 MW solar photovoltaic (PV) plant in Namibia.<sup>5</sup> This poses the question as to why the independent renewable energy projects have taken so long to make any significant advances. Given that both solar and wind energy are established energy sources, and since Namibia has a geography well known both for high level solar irradiation and wind, this study will focus on legislative, policy and administrative issues that may have been standing in the way of renewable energy supply sufficiency for Namibia. It shows that, even when market conditions are obviously conducive to renewable energy development, other non-market barriers may prevent development. Although this study is on Namibia, it bears lessons for many African countries with similar energy problems as Namibia. The next section gives a background to the Namibian situation in terms of electricity. This is followed by a literature review, which is followed by a discussion of the methodology used for the study. The results are then discussed and conclusions and recommendations given.

## Background

### Namibia's Policy Environment

Article 95 of the Constitution of the Republic of Namibia elaborates on the promotion of the welfare of the people.<sup>6</sup> It states that Namibia will actively promote and maintain its peoples' welfare. Article 95(e) focuses on government's 'ensurance that every citizen has a right to fair and reasonable access to public facilities and services in accordance with the law'.<sup>7</sup> While this does not specifically provide for access to energy, other policy documents, such as the 1998 White Paper on Energy Policy, highlight the importance of access to energy to guarantee a certain standard of living for Namibia's citizens.

Even though the White Paper is almost 20 years old many of the supply challenges have not changed, while demand has steadily grown. Namibia remains highly dependent on imports and therefore vulnerable to actions on the part of its neighbouring countries that are all experiencing energy shortages at present. On a positive note, great strides were made in terms of rural electrification and increased liberalisation of the sector. The Electricity Act of 2007, which allows for the liberalisation and the creation of a regulator, the Electricity Control Board (ECB), has been enacted. The ECB has been established and has come of age, even though close ties to the national electricity monopoly, NamPower, remain.

With the introduction of the Electricity Act and the ECB, the sector's governance framework and structure have been greatly enhanced. While the regulator still needs to be strengthened and sectoral liberalisation along policy provisions needs to be implemented; this is no longer the same challenge it was in 1998.

Namibia has implemented many recommendations from literature that are required to enable the development of a renewable energy sector. Key issues in this regard are the partial liberalisation of the electricity supply industry, the introduction of an interim Renewable Energy Feed-In Tariff (REFIT) programme and the compilation of a Power Purchase Agreement (PPA) that considers many of the mechanisms for the removal of non-technical implementation barriers. Since the beginning of 2016, a number of consultative workshops have been held with stakeholders to discuss the draft Independent Power Producers (IPP) and renewable energy policies. However, since the industry is still struggling to gain the necessary traction, it is important that research including industry stakeholders be conducted to understand the reasons why specific stakeholders are unable to proceed with their projects.

### The Interim REFIT Programme

After a number of public consultations and various drafts, NamPower made final power purchase agreements (PPAs) under Namibia's interim REFIT programme available to licensees to whom potential licences were granted. These PPAs issued on 15 June 2015 are non-negotiable, and signed copies and supporting documents proving access to finance and technology had to be returned to NamPower six months later.<sup>8</sup> Since only a capacity of 70 MW will be allocated under the interim REFIT programme, not all the currently 27 licensed IPPs will be able to participate in the programme. Different REFIT tariffs for various renewable energy technologies include transmission costs. The various REFIT tariffs have been summarised in Table 1. The tariff will be escalated at the Namibian consumer price index (CPI) on an annual basis.

**Table 1: REFIT Tariff per Technology**

Technology	Tariff
Solar PV	N\$1.37/kWh
Concentrated solar power CSP (with storage)	N\$1.90/kWh
Wind	N\$1.08/kWh
Biomass	N\$1.28/kWh

Source: NamPower<sup>9</sup>

There will be no government or NamPower guarantees for the IPPs, but power producers and their financiers need to rely on the electricity tariff and the long (25 years) tenure of the PPA. Terms and conditions of the PPA are specified.<sup>10</sup> Against this background, it is important to understand what lessons can be gleaned from the literature in terms of policy mechanisms for renewable energy.

## Literature Review

The literature reviewed for this paper highlights the need for renewable energy, explores international experience regarding renewable energy and barriers thereto that prevent governments from achieving their renewable energy goals.

## The Case for Renewable Energy

Modern states depend on the ready access to energy to achieve their set policy goals. Such policy goals do not only address industrialisation and economic growth, but also affect other areas such as transportation, the environment, political stability and ultimately the quality of life. Access to energy and the costs of energy are critical to economic development and hence need to be considered in policy design. Energy policy plays an important role in supporting economic performance and sustainable growth.<sup>11</sup> As a result, it is a powerful tool for providing an economic stimulus or supporting development-orientated budgets. On the other side of the coin are the negative economic effects that a lack of electricity or increasing electricity prices brings with them. One of the reasons for development delays in Africa and a continued struggle to overcome poverty can be attributed to a lack of access to modern energy services.<sup>12</sup> Since access to energy and the costs thereof are critical to economic development, energy policy plays an important role in supporting economic performance and sustainable growth.<sup>13</sup> This is also acknowledged by Namibia's policy makers. Namibia's National Development Plan 4<sup>14</sup> highlights that electricity shortages could create severe bottlenecks in terms of Namibia's development, while the White Paper on Energy<sup>15</sup> recognises the need for energy to achieve sustainable development for the country. This is reflected in the goals that serve as a framework for Namibia's energy policies: 'Effective governance; Security of supply; Social upliftment; Investment and growth; Economic competitiveness and efficiency; and Sustainability'.<sup>16</sup>

The drive for development and increased consumerism has led to climate change resulting from a reliance on fossil fuels.<sup>17</sup> To be able to continue with modern activities, while minimising adverse effects on the environment, different and more sustainable energy sources need to be considered. Renewable energy brings various benefits to a country. It not only provides opportunities for energy supply diversification, but also reduces emissions and provides the economic benefits that come with the absence of fossil fuels.<sup>18</sup> Wang attributes the following benefits to renewable energy: the decrease of carbon dioxide emissions; the promotion of energy security on account of a more diversified energy mix; the curtailment of energy vulnerability through a decreased exposure to fossil fuel price fluctuations; and the support of economic development through job generation, which in turn leads to higher household incomes and poverty reduction.<sup>19</sup>

Besides addressing key issues related to energy security, the introduction of renewable energy technologies can address many of Namibia's policy goals such as capacity building and economic empowerment. Smaller scale solar PV and wind projects can play an especially significant role here

since they are not as technically complex and capital intensive as large-scale base-load projects. This means that these projects can be used for local skills development and for local participation.

### **Non-technical Barriers to the Implementation of Renewable Energy**

Regardless of its benefits, literature lists numerous barriers to renewable energy penetration. Some barriers may be more pronounced in certain jurisdictions or when using a specific technology. Painuly's study on renewable energy barriers lists the following groups of barriers to the uptake of renewable energy:

- Market barriers;
- Financial and economic barriers;
- Institutional barriers;
- Technical barriers;
- Social; cultural and behavioural barriers; and
- Other barriers.<sup>20</sup>

The German Federal Ministry for Economic Cooperation and Development<sup>21</sup> identified the following barriers:

- Subsidised electricity prices that make renewable energy appear too costly;
- Subsidies for fossil fuels, eroding all chances for renewable energy to compete with traditional generation;
- Monopolised electricity markets that hinder new power producers from entering the market;
- Strong government intervention in electricity markets that put public utilities in a more favourable competitive position relative to private sector players;
- Uninformed stakeholders, especially policy makers that do not understand the economic, social and environmental advantages of renewable energy;
- Lack of bankability (this may either be on account of project and market characteristics or the ability of the banks to take on long-term low interest rate loans);
- Lack of interaction and allocation of responsibilities amongst parties involved in the implementation of renewable energy;
- Grid connectivity issues where the grid is not able to absorb fluctuating power from renewable energy; and
- Inadequate public support for renewable energy.

Research by Ferroukhi, Ghazal-Aswad, Androulaki, Hawila, and Mezher<sup>22</sup> also lists a lack of political support, while a study by Singh<sup>23</sup> on renewable energy in Pacific Island countries found that the implementation of renewable energy projects were mainly hampered by a lack of institutional processes, insufficient policy and regulatory frameworks and inadequate human capacity.

Goodier and Chmutina found that, contrary to popular belief, the major non-technical barriers to renewable energy were not only of a financial nature. Their research further discovered that financial barriers were connected to governance barriers.<sup>24</sup> The financial barriers, therefore, could have been greatly reduced had the governance barriers been absent. This also highlights the need to consider the relationship and interaction between different barriers. When merely addressing

one barrier in isolation, recommendations for the removal of barriers may be ineffective. This is supported by research from Yoon and Sim on renewable energy barriers in South Korea.<sup>25</sup> They found that multiple government actors were involved in the renewable energy sector and that, since their efforts were uncoordinated, the proliferation of renewable energy was hampered.

Analysing the effectiveness of renewable energy interventions such as incentives and other government programmes requires a systems approach. Not only do renewable energy programmes tend to be interrelated with a number of other programmes outside the sector, but may also be affected by policies from other sectors.<sup>26</sup> Specific policies that could influence the uptake of renewable energy projects usually include policies on the following:

- Competition enhancement;
- Domestic market and investment liberalisation;
- Special taxation regimes; and
- Subsidies.

Often a policy approach is warranted to achieve the techno-economic potential of a specific renewable energy source.<sup>27</sup> These approaches can either eliminate the barriers, or establish an environment where the private sector market participants will proceed with projects while the barriers are present.

### Measures to Address Barriers to Renewable Energy

Chirambo argues that most of the risks and uncertainties that prevent private sector investment in Africa's energy sector can be addressed through better policies and regulations.<sup>28</sup> Specific measures to encourage renewable energy consist of obligations to buy and obligations to supply that are usually contained in a PPA. The PPA governs the conditions under which the IPP receives access to the electricity grid and the price he will receive for the energy delivered. This applies typically to monopolistic markets where regulated access and prices are used to minimise transaction costs.<sup>29</sup> The following incentive mechanisms can promote renewable energy by regulating access and compensation: feed-in tariffs to provide guaranteed long-term purchase prices; auctions or tenders to achieve a set amount of energy generated; and green permits or certificates.<sup>30</sup>

In Namibia, Oertzen makes a strong case for utilising renewable energy technology and repeatedly highlights the need for policy intervention. His research, however, fails to explain why this intervention has not materialised or what needs to be done to guarantee that the necessary policies are implemented.<sup>31</sup>

As a result, there is a need to determine if appropriate policy formulation and implementation, which ensures that the interests of all parties are adequately addressed, would be the appropriate solution to ensure the implementation of renewable energy projects in Namibia. Namibia's government is faced with a conundrum: on the one hand it needs the IPPs (due to a lack of internal capacity and because of the statements in the White Paper on Energy Policy), but on the other hand it (in conjunction with NamPower and the ECB) seems to date to have failed to create the structures within which an IPP can successfully operate.

While internationally a number of renewable energy barriers have been identified, the specific barriers at play in Namibia are still unclear. Therefore, research is required to identify the barriers

that are prevalent in Namibia and to provide recommendations on the appropriate measures to remove these barriers.

## Research Methodology

The research's main objective was to evaluate the suitability of Namibia's energy policies and practices to harness renewable energy to enhance Namibia's energy self-sufficiency. In order to achieve this, the study evaluated the non-technical barriers that hamper the uptake of renewable energy. The end desire was to propose policy-based solutions to address these shortcomings. The study focused on IPPs in the renewable energy space even though the findings may be relevant for IPPs in general. The study was limited to renewable energy sources that can supply between 500 kW and 5MW of electricity to Namibia's electricity network, i.e. projects currently falling under the interim REFIT programme.

A qualitative research approach was taken for this study. The findings from the literature review were used to develop individual qualitative interviews. Semi-structured interviews were used, because this allowed the researcher to establish, in detail, the underlying problems concerning the lack of implementation of renewable energy sources in Namibia.

Individual interviews were chosen over focus groups since the interviews avoid phenomena such as group think and allow more reserved individuals to express themselves clearly. It is, however, acknowledged that this means that valuable group dynamics, for example when one team member piggy-backs on others' ideas, were missed.

Interviews with the potential participants as part of the original population and additional participants suggested by the initial sample (snowballing) took place in 2016. The target population included all key stakeholders that are involved in renewable energy projects between 500 kW and 5 MW. The initial target population identified consisted of the Ministry of Mines and Energy, the ECB, NamPower, and developers and funders known to be interested in the renewable energy sector. As part of the questions, all respondents were asked to provide names of other individuals who could add value to the study, thus creating a revised target population. In total 20 participants were interviewed from the population represented in Table 2.

Based on the population size of 49, a sample size of 20 provided that the responses gathered during the interviews with the sample group would be reflective of the response that more than 80 per cent of the population would provide, at a 95 per cent level of confidence. Participants were first asked general questions to ensure that they were able to talk freely and provide their own insights. Then more detailed questions, based on existing research on barriers to renewable energy were posed, to ensure that participants could speak on other barriers that may be prevalent, but that they had not cognitively recognised previously. This then followed into participants being able to suggest potential solutions to the removal of the identified barriers. The data from the individual interviews were transcribed during the meetings based on the interview guideline. The information was then aggregated to determine the frequency at which specific barriers were listed.



**Table 2: Initial and Revised Target Population**

	Initial population	Revised population
Renewable energy IPP licensees	27	27
EPC contractors		3
Industry consultants – technical		3
National utility (NamPower)	1	2
Regulator (ECB)	1	1
Ministries	1	2
Debt financiers	4	6
Equity funders	4	4
Industry consultants – financial		1
<b>Total population</b>	<b>38</b>	<b>49</b>

*Source: Author's compilation*

## Research Results

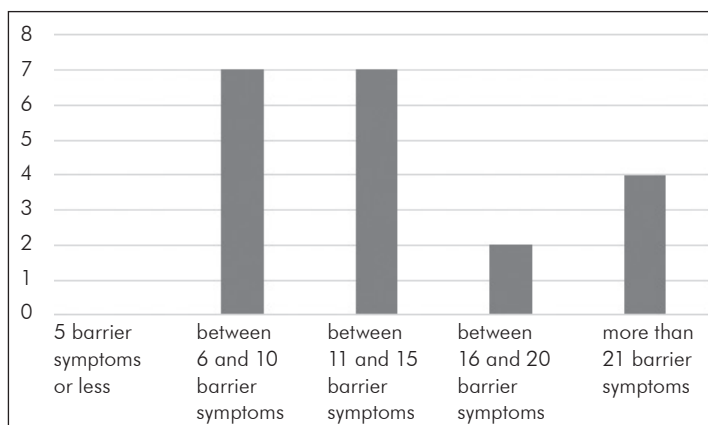
All respondents described the pace at which renewable energy projects are developed in Namibia as slow or very slow, while three added the qualification that the process was also haphazard. One interviewee even described Namibia's renewable energy implementation as "alarming slow", while another highlighted that the process was "very fragmented without a clearly thought through strategy and unsystematic".

The process has been so slow even though there has been a "huge interest for renewables" as one of the interview respondents put it. This is further underlined by the statement made by another respondent that "policy development has failed to cater for what the industry could offer" to address Namibia's impending energy shortages. This highlights the importance of considering the reasons for the delayed uptake of renewable energy projects in Namibia and determining mechanisms to counter the status quo. The following sections will further discuss the reasons that the interview participants put forward for the slow uptake of renewable energy projects in Namibia.

There was a great variance in the number of barriers identified by different stakeholders interviewed – this depended mainly on their position within the industry. Typically stakeholders related to government were more oblivious to the extent of barriers present, while financiers and industry consultants were by far the most critical. That said, all participants agreed that there were at least five barriers facing the implementation of renewable energy projects in Namibia as shown in Figure 1. In total, 14 respondents identified between five and 15 symptoms of barriers.



**Figure 1: Number of Interview Participants Identifying Barriers**



Source: Author's calculations

When asked about the reasons for the limited uptake of renewable energy in Namibia, 80 per cent of participants listed uncertain government policies as a major barrier to the development of renewable energy in Namibia, while 70 per cent also included concerns over a highly controlled energy sector and a clash of interests. Table 3 provides an overview of the symptoms of barriers that were identified by more than 50 per cent of the interview participants.

**Table 3: Barrier Symptoms Mentioned by more than 50 per cent of the Interviewees**

Barrier symptoms	Percentage
Uncertain governmental policies	80
Highly controlled energy sector	70
Clash of interests	70
Lack of a legal/regulatory framework	55
Lack of political support	55

Source: Author's calculations

By analysing the barrier symptoms identified above, it soon becomes clear that most of the interviewees have identified governance issues and policy gaps as the key barriers limiting the development of renewable energy projects in Namibia. Even though the Namibian energy market is faced with its own unique challenges, most of the interview participants highlighted the barriers that were mentioned most often in literature, namely policy and financial barriers. While these are two distinct issues, they are also closely related: without a proper policy framework, it becomes impossible to properly govern. This has also been highlighted in the literature review, where often specific mention was made of the interrelated nature of various barriers.

Besides the key issues related to policy and governance, financing barriers and technical constraints were also highlighted. However, if one looks further at the responses, especially from the funders, they indicate that the perceived financing constraints are the funders' response to the policy and governance uncertainties. This is reflected in the following comments made by financiers:

- 'There is no overall framework of what we want to achieve as a country'
- 'You can stop a lot of issues by putting the right structures in place'
- 'The playing field is not defined'
- 'There is enough capacity from local banks'
- 'Risk allocation in the PPA is unbalanced'
- 'The Ministry of Mines and Energy does not have a proper renewable energy policy'
- 'Unnecessary political involvement'
- 'Irregular tender awarding procedures'
- 'Too many vested interests'
- 'No legal framework'
- 'Energy isn't a tradeable commodity due to the absence of wheeling agreements'
- 'Everyone waited for an answer on the implementation agreement for two years'
- 'Put implementation agreement in place'

## General Comments Highlighted During the Interviews

A number of parties interviewed indicated that Namibia had the potential to become a major electricity exporter to the region, yet for some reason "Namibia was afraid to have too much electricity". To enable this, sector reform and political will are required, but given Namibia's political stability, position in the region and transmission network, there certainly is the potential to become an energy exporter. In all likelihood there would be donor funds available to assist in developing such a plan. Another party expressed this differently: "In a short period of time, we could be a supplier of energy in the region, but for this we need government strategy and drive". This again highlights how interconnected the solutions to addressing most of the barriers are, especially how important it is to have policies and the necessary political support in place.

One of the other issues that would need to be considered as part of broader economic policies is the cost of empowerment. A number of interviewees mentioned this when talking about transaction costs. To participate in the interim REFIT programme, projects need to be at least 30 per cent owned by empowerment partners, who often require free carry, or if they are the original licence holders, high cash payments for the dilution of their stakes. A number of interview participants recommended that there should be a policy decision to ensure the optimal balance between empowerment and affordable energy prices. It was recommended that these decisions consider what the building blocks of providing electricity at reasonable cost are, as well as whether cheap electricity is not more empowering than ownership.

## Proposed Solutions to Remove Renewable Energy Barriers in Namibia

A number of recommendations to address the main barriers listed during the interviews have been made to encourage the greater future uptake of renewable energy in Namibia. While some of the recommendations are applicable to all the key barriers (since they are highly interrelated), others more specifically address individual barriers.

The overall recommendation that can be made to government is echoed in the words of one of the interview participants: “create a conducive environment for investment in everything you say”. That said, with the exception of policy uncertainties, the interviewees indicated that Namibia had most of the other components needed to attract investors, namely:

- peace;
- political stability;
- capital availability;
- access to skills;
- a well-developed financial services industry; and
- infrastructure.

While Namibia has implemented some of the measures recommended in literature to remove barriers (such as the implementation of the interim REFIT programme), the slow uptake of renewable energy points to remaining barriers that need to be addressed, for example greater stakeholder alignment, as advocated by Yoon and Sim.<sup>32</sup> It is important that government urgently pronounces what it wants to do regarding renewable energy and IPPs and how it wants to do this. Combining the findings from the interviews and the literature review provides the following recommendations to address policy uncertainty and to provide an appropriate legal framework for Namibia:

- Draft a new White Paper;
- Provide an updated National Integrated Resource Plan (NIRP) as a matter of urgency;
- Draft a renewable energy policy;
- Ensure that the above are aligned to the national development plans and the overall legal framework for Namibia;
- Ensure that the policy documents address the roles and responsibilities of the various stakeholders;
- Ensure that the policies are implemented; and
- Introduce REFIT rules (to guide the procurement process beyond the interim REFIT programme); and, once a policy is in place on renewable energy, ensure that other ministries (for example, the Ministry of Industrialisation, Trade and SME Development) also align their activities to ensure that clashes between ministries are minimised and that the overall vision of the country is met.

While there may be merit in Namibia's single buyer model it is, however, recommended that the government considers opening the sector further and permits wheeling to other parties in Namibia and beyond. This would have the added benefit that the need for government guarantees could be reduced, since IPPs have got the option to sell to more than one buyer.

Both the interview responses and the literature have confirmed that clashes of interest result from role confusion, where politicians meddle in administrative day-to-day functions and administrators dabble in politics rather than attend to the operational issues they have been tasked with. The clashes of interest can be addressed by providing (and implementing) clear role definitions in legislation and by focusing on good governance, which has the best interest of Namibia at heart.

While the discussions during the interviews usually centred on the absence of government guarantees or an implementation agreement from government, it is also important to consider other areas that may require political attention. For example, a number of policies from outside the energy sector could hamper the uptake of renewable energy. These include policies to enhance competition, taxation regimes and financial sector reforms to support investment.

Overall, once a robust policy-making process that takes the concerns of all stakeholders into consideration has been finalised, the biggest part of the work of removing barriers to renewable energy in Namibia has been done. Throughout the policy-making process, and later during implementation, politicians should lend their support and oversight to the policies to ensure that they are implemented in the best interests of the country.

## Conclusion

Electricity is a critical infrastructure-related component that aims to make life better for the people of the country – not only on account of improved lifestyle, but also because of the jobs and industries that it makes possible. Security of energy supply is important to guarantee the continuous development of Namibia and to ensure that the country reaches its developmental goals contained in Vision 2030. The need to promote the welfare of the people is enshrined in Article 95 of the Constitution of the Republic of Namibia. Other policy documents, such as the 1998 White Paper on Energy Policy, highlight the importance of access to energy to guarantee a certain standard of living for Namibia's citizens.

An efficient local energy sector is critical for Namibia to reach its developmental goals, especially in light of the fact that Namibia imports a large proportion of its energy needs. Namibia has access to ample renewable energy resources that can be harnessed to create local jobs, substitute imports and guard Namibia against commodity price fluctuations. Hence, adequate policies to support renewable energy are required to drive Namibia's development agenda.

As a result, this research focused on establishing the reasons for the lack of renewable energy projects in Namibia to ensure energy supply sufficiency with a specific focus on providing suggestions for policy interventions required to correct the status quo. During the interviews key barriers to the implementation of renewable energy projects in Namibia were identified. Most of the interviewees have identified governance issues and policy gaps as the key barriers limiting the development of renewable energy projects in Namibia. These issues are closely related: without a proper policy framework, it becomes impossible to properly govern. This interrelated nature of barriers was also highlighted in the reviewed literature, which emphasises the need to follow a systems approach when trying to eliminate policy barriers. The results of this study extend beyond

Namibia to the majority of African countries that have not made headway in terms of renewable energy.

This study firstly identified the non-technical barriers that have delayed the implementation of renewable energy solutions. Secondly, based on the identified barriers, existing policies, the literature review and the interview responses were used to propose policy mechanisms to enhance the role of renewable energy to secure energy self-sufficiency. The research ended with a set of recommendations.

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