

Exploring the leading role of government in renewable energy financing

1.0 Introduction

Energy is essential for poverty alleviation, economic growth and improved standards of living. Often absence of energy has been the root cause of various economic development problems including healthcare, education, transportation, and industrialisation among others. Historically, the conventional sources of energy were found to be useful and inexpensive. Over time, the dependence on them has increased with industrialisation and expanding population. But their exhaustible nature poses a challenge for their sustained use in the long run (Oluwatola, 2017). Furthermore, their usage is associated with several environmental problems like air pollution, making them harmful for both human and environmental health. In order to address these challenges a transition towards renewable sources of energy has been advocated by many (for example, Scheer, 1995; Sharma et al., 2012). The efforts of building renewable capacity in this regard have been gradual during the last decades, especially in the developing nations. A demonstration of this can be observed with several policies, regulatory and institutional arrangements that actively aids the scaling-up of renewable energy ecosystem. Even so, the nations need to be confronted with the hurdles associated with financing of renewable energy, project development, absent transparency of industry and regulations and difficulties of acquiring raw material (Irena, 2021). Therefore, there is a need for constructing a robust groundwork to financing and monetarily underpinning efforts for low carbon pathways (Shakti, 2021). A salient feature of such financing can also be observed in its contributions towards a green and clean economic growth while steering funds to sustainable energy initiatives (Shakti, 2021; Bhandary et. al, 2021). The Paris Agreement was laid out with this objective to commence a pool of funding among and within nations that helps build a capacity for low-carbon pathways. However, there remains a pertinent gap in the throughput of financing renewable energy across the globe as explained by several studies and identified by Bhandary et.al (2021). Furthermore, to illustrate this gap Bhandary et.al (2021) share an incident of estimations on adaptation needs wherein they observe a substantial

mismatch between actual (\$30 billion) and potential investments (\$1.8 trillion). They emphasize on the imperative need for effective monetary support with collaborated efforts of government and private sector aligned towards green economy and a sustained development. This view is supported by IEA (2021) that presents an interesting example of dependence of consumers and organisations on the regulatory planning and institutional projects for acquiring monetary asset. These investments made by developers and investors, to gain profitability essentially promote the capital-intensive technologies in the renewable energy market. Moreover, since the investments are subject to market volatility, a push from the regulatory bodies can scope the way for advanced renewable energy technology (RET) technologies and further advocate the need for producing clean energy via RET. Furthermore, the authors also advocate that RE investments in developing countries should be accompanied by attracting private capital while creating local level stimulus that fills the investment gaps. This suggestion mainly emerges with the limited ability of public funding in developing economies, and highlights the collaboration between public and private investors of RE (ibid).

The policy effectiveness still cannot be entirely surrendered due to its significant contribution in tackling hurdles in transitioning to green energy and visible external benefits associated with renewable energy production. Moreover, the government intervention is thoughtfully considered by Kalyuzhnova et al. (2018) to mark its significance in pulling up the producers from the anticipated barriers in RE market. The authors dynamically vouch for regulation and policy effectiveness that not only stimulates the transition to low carbon pathways but also creates capacity for energy production and generation. While the government is still striving its way to include these green growth policies as a part and parcel of the policy mix, this study raises some notable questions in response to the effectiveness of regulation and policy planning, specifically targeted for India.

To assess the existence and implementation of policy structure, the study seeks to explore the various explanations of the directional literature and prepare a detailed understanding of renewable energy financing as understood

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previously. Following questions are sought to be understood and answered in an exploratory and descriptive manner:

1. Who are the participants/investors and what are the various ways of financing renewable energy projects in India?
2. Why is there a need for government financing?
3. Is the financing really consistent and effective?

All these doubts and debates, which are now a part of our energy and economy literature, stand still to discover a way out and to deduce the government's role in renewable energy policy mix. With the clash of roles of government and market participants, the study aims to present a brief understanding of the literature to promote the perspective on significant role of government in renewable energy sector, including solar, wind and others.

The next section details the various sources and methods of financing at a global level. This section also explores the effectiveness of certain policy instruments, as discussed in literature, while developing the need for government financing. Section three talks about climate financing policies used for funding RE projects deployment within India. The assessment is especially significant to explain the effectiveness of RE policies in creating a robust environment for financing green projects. It also explores the role of government with the several instruments and institutions established towards achievement of Net-Zero emissions by 2050. This section is followed by a concluding summary.

Keywords: Renewable energy, financing renewable energy, FIT, RPS, VGF.

2.0 Financing renewable energy

A. WHO FINANCES?

It is quite a challenge when investing in the low carbon energy with the sole aim of mitigating the climate change (Grubb, 2014; Stern, 2015). This happens because such energy determines the speed and intensity of climate change. Even so, the investment in renewable energy is taking on a superior position when compared to fossil fuels (Mazzucato and Semieniukb, 2018), with an exceptional growth rate. Previously, the literature has amplified the focus on only certain aspects of renewable energy. Langniss (1996) identifies six financing players, namely industry, large utility/industries, house owners, municipality and energy community. In another study by Hall (2002), he discusses the government and venture capitalists as an important source of financing renewable energy. Finance has been assigned a submissive role when looking for what is being financed. Government has been tasked to overcome underinvestment whereas the venture capitalists overcome information asymmetries (ibid).

With the emergence of renewable energy over the past few years, Mazzucato (2013) has tried to capture the significance of more recent actors assisting in the financing

of renewable and green energy, namely public sector. Donastorg et. al. (2017), assert the existence and role of government and non-governmental actors in the creation and design of these financial instruments for supporting the renewable energy sector. The former relates to public sector whereas the latter includes private sector funding. Apart from these, there are some other traditional sources of investment that comprise loans from banks and equity/venture capital.

The theoretical evidence from Mazzucato and Semieniukb (2018) provides the details of public banks as a new entrant in the list of financial actors for countries like Brazil, China, Germany, Japan and the European Union. The study further seeks to explore the role of public banks in climate finance funding that is foreseen to provide monetary support for challenging projects and promote sustainable ideas. The public banks have also been underpinning industries jointly with some public institutions. Additionally, private sectors have been introduced as a way to aid particular technologies and sectors (Mazzucato and Wray, 2015).

Even with such financial support, the literature has not been success in devising a specific path to channelizing these funds (Mazzucato and Semieniukb, 2018). There is however, a need to recognize and identify the innovative pathways of RE financing to provide for the growth of RE markets across the nations. This way actors and situations affecting policies would be identified and examined thoroughly (Stirling, 2010). To be able to direct the studies in such a direction, it is necessary to chalk out the various actors that help finance renewable energy and their impact on the policies undertaken for implementation. Furthermore, there is a need to understand and assess the risk-taking potential of each of these financial actors in order to determine the best investor for a particular project of renewable energy.

The study undertakes a review of directional literature, focussing on the role of government in financing RE prospects. To begin with, the sources of funds (investors) are explained below:

a. Private sector

It is more of an obligation to borrow from private sector rather than an option. Given the intensity of financial struggles faced by developing countries, makes the engagement of this sector a necessity for facilitation of the renewable energy sector smoothly. The private sector withholds enormous opportunities and strong benefits for the development of the nation and the non-government businesses (Donastorg et. al., 2017).

b. Public sector

Another sector that has helped embark the journey of renewable energy sector is the well-known public sector. Nowadays, the adoption of transformation from conventional to non-conventional sources of energy has led the public sector to commit to the international obligation of mitigating

climate change. This has opened up several economic opportunities and escalated the energy access to population worldwide. Yet, this support from public sector seems to be lagging quite a lot and requires careful examination. The importance of each financial instrument needs to be understood thoroughly to enable the judicious utilisation of monetary assistance (Donastorg et. al., 2017).

c. Other investment sources

This involves mainly two sources (Donastorg et. al., 2017):

- i. Borrowing from a bank (loan)
- ii. Through equity capital (selling stakes or shares in the business, among others). The returns from equity capital tend to be higher compared to any other source. Thus, it is preferred more.

B. GOVERNMENT FINANCING

Before exploring the various ways through which government finances renewable energy sector, it is important to answer the two most emerging questions:

- a. Why would government invest?
- b. Why should government invest?

OECD (2017) report develops on this increasing role of government in mobilising the investment prospects and innovation in the renewable energy sector to promote green growth and assist in climate change mitigation. It sheds light on the individualistic perspective of considering policy incentives in isolation. Rather, innovation and investment require a consciously planned effort in conjunction with the deployed energy goals. The report justifies the claims by an instance of implementation of Basel III which unintentionally led to a fall in investments for climate mitigation practices.

Even the International Energy Agency has analysed the continuously rising role of government aids in the form of subsidies that have helped in the deployment of renewable energy technologies.

White et al. (2012) elucidate the gravity of government's actions undertaken to improve social welfare regardless of their role in RES. Even though private firms are profit drivers, government aims at "energy security, energy supply, energy affordability, sustainability, and adapting to and mitigating climate change."

Employment generation for its citizens that is accompanied with renewable energy projects drives the government investment to a large extent.

"The most important role of the government in the RES market is to provide an environment through rules and regulations that will support free market forces, i.e., that will provide a system for market development that will not require government intervention to maximise social welfare" (White et al., 2012).

In the dynamic RE market, it is therefore important for

government to do a rain-check on the varying situations and maintain policies for greater social welfare. With globalisation in place, government needs to pace up their game by indulging in projects and solutions that can help raise some income; this will add to the existing revenue base.

C. METHODS OF FINANCING

Electricity consumption is said to consist of the global demand and requires much attention while being brought to the forefront. Such demand is usually the most important when considered from a firm's point of view. It is the economic advantage of renewable energy that grants it a position of competing with the conventional sources of energy like fossil fuels.

Moreover, there are numerous ways of reducing the problems of carbon emission and climate change, which include the deployment of renewable energy and encouragement to technological innovation of such non-conventional sources. This, as authors have claimed, will aid in improving the environmental situation and also ameliorate the well-being by creating green jobs (Abolhosseini and Heshmati, 2014).

As Abolhosseini and Heshmati (2014) states that, "The aim of increasing the contribution of renewable energy to the total energy supply is of worldwide importance in mitigating the negative energy effects of climate change." Yet, a significant challenge in establishing the importance of renewable energy lies in its policy consistency and also the financial support extended by various financial actors (White et al., 2012). Thus, there is an urgent need to discuss some of these support mechanisms extended by the government to induce changes favourable for green economic initiatives. The policies involve mainly Technology-Push policies, i.e. the public R&D and Market-Pull policies namely public investment, tariff incentives, renewable obligations, environmental taxes. The financing policies can also be divided on the basis of price and quantity, i.e. Price based policy (e.g. FIT) and Quantity based policy (e.g. RPS) (Kim, Heo and Kim, 2015). Additionally, Abolhosseini and Heshmati (2014) discuss and develop the pathways of three important policy incentives primarily utilised by government to provide financial assistance, namely feed-in-tariff, tax incentives and tradable green certificates. On the one hand feed-in-tariffs guarantee an above-market price for producers-to-assist in the deployment and development of renewable energy sources (Kim, Heo and Kim, 2015), on the other hand tax incentives are schemes involving subsidies and tax reductions provided to producers for adopting the energy saving measures at work (Abolhosseini and Heshmati, 2014). Another significant finance policy includes tradable green certificates that is given to utilities in a pre-decided amount for each unit of power generated. Renewable portfolio standards (RPS) are also one of the commonly used policies to finance the renewable energy by gradually increasing its amount

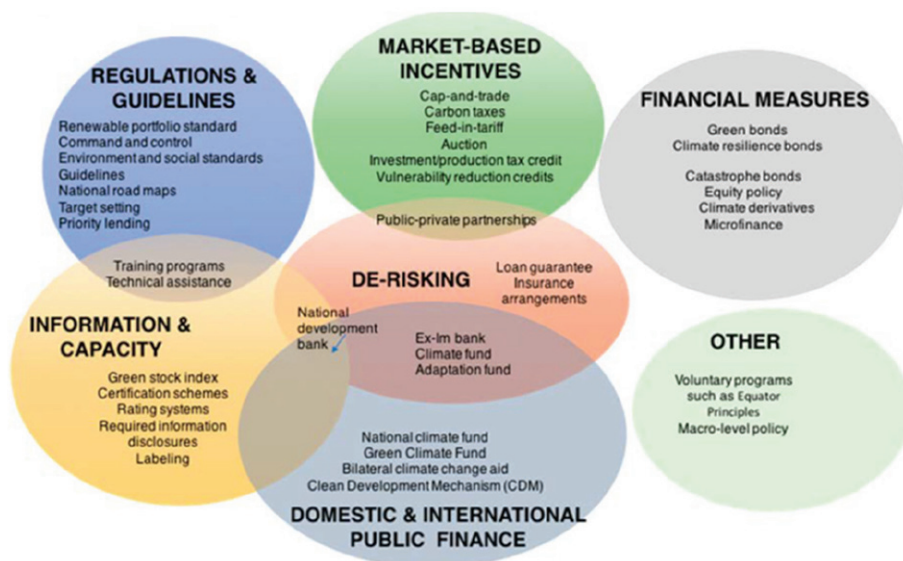


Fig.1: Classifying the green finance policies based on functions

Source: Adapted from Bhandary et. al (2021)

delivered by electric utilities to consumers (Kim, Heo and Kim, 2015). RPS is considered a quantity-based policy in contrast to FITs which are price based.

However, the consistency and effectiveness of these traditional policies are considered controversial and the literature on green financing firmly believes that an optimal emission tax in conjunction with a subsidy can flourish rather well. This will not only support the development of novel

renewable energy projects but also divert the focus on minimal environmental degradation, with FITs additionally offering a long-term purchase agreement for the sale of renewable energy electricity (Abolhosseini and Heshmati, 2014; Kim, Heo and Kim, 2015). Fig.1 represents some of the important finance policies, as adopted across the globe.

In addition to this, Bhandary et. al (2021) analyse and examine the meanings of different climate finance policies while evaluating some specific policies, as introduced in several countries, to ascertain the gap in regulation and implementation of climate finance (Table 1).

A vast number of policy initiatives have been adopted across the globe in real time, as discussed above, to finance renewable energy. The distribution of such global investments is depicted in the Fig.2 over a period between 2010 and 2020. With the intensive release of carbon, we can study these policies from a different perspective which indulges a cross-national incentive. This will also allow countries to co-produce and help each other deliver the policies more effectively and efficiently. The greenhouse gas

TABLE 1: TAXONOMY OF CLIMATE FINANCE POLICIES WITH COUNTRY EXPERIENCE

Policy Instrument	Policy definition	Country experience
Targeted lending	Requiring banks to lend a certain portion of their credit or deposits towards certain policy priorities, such as agriculture or clean energy.	India, China
Green bonds	Bonds earmarked for projects with environmental and/or climate benefits	China, Indonesia, India, the US
Loan guarantees	Governments commit to cover the borrower's debt obligation in the event that the borrower defaults on climate change projects.	The US, International Finance Corporation (IFC)
Weather indexed insurance	Index-based insurance provides pay outs based on a measurable condition that is related to agricultural production loss, such as drought.	India, Mongolia, and Ethiopia
Tax credits	Permitting taxpayers to subtract, dollar for dollar, from taxes that they owe in return for new investments in climatefriendly projects.	the US, Netherlands, Japan
Feed-in-Tariffs	Providing either a fixed total electricity price per kWh or a fixed premium on top of the wholesale rates of electricity for fixed periods for low-carbon electricity providers.	Spain, Germany, China
National development banks (NDBs)	Government-backed, sponsored, or supported financial institutions that have a specific public policy mandate to promote low-carbon development in a specific country. The NDBs in this study do not include those at multi-lateral, regional or local levels.	KfW in Germany, China Development Bank in China, and Indian Renewable Energy Development Agency in India
National climate fund	Funding vehicles designed by governments to mobilize, access, and channel climate finance.	Brazil, Ethiopia, Bangladesh, Indonesia
Disclosure	Requiring companies to report climate change information	The US

Source: Adapted from Bhandary et. al (2021)

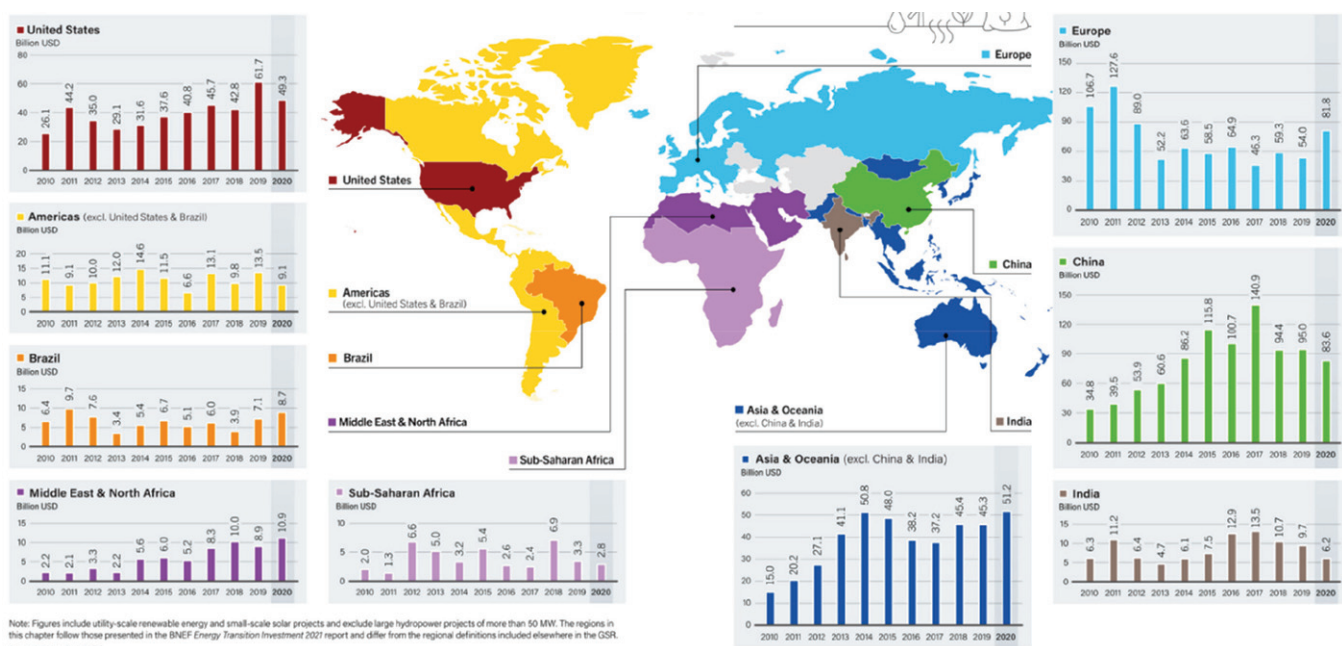


Fig.2: Global investment in renewable energy capacity

Source: Adapted from REN21, https://www.ren21.net/gsr-2020/chapters/chapter_05/chapter_05/

TABLE 2: ASSESSING THE COMPREHENSIVENESS OF CLIMATE FINANCE POLICIES IN PRACTICE

Level of effectiveness	Mobilization effectiveness	Economic efficiency	Environmental integrity	Equity
High	FiT loan guarantees NDBs	Targeted lending Green bonds	Loan guarantees FiT	
Medium-high	Green bonds	NDBs	NDBs tax credits	Weather indexed insurance (low in China) NDBs tax credits
Medium	Tax credits national climate funds	Loan guarantees disclosure policies National climate funds	Targeted lending Green bonds disclosure policies national climate funds	FiT National climate funds
Low-medium	Targeted lending disclosure policies			Loan guarantees
Low		FiT tax credits		Green bonds
N/a	Weather indexed insurance	Weather indexed insurance	Weather indexed insurance	Targeted lending disclosure policies

Notes: 'High' means very effective, 'medium' means effective, and 'low' means not very effective. Details about the evaluation and country experience are available in Appendix B.

Source: Adapted from Bhandary et al. (2021)

emissions require a considerable effort and so does its mitigation; it is as authors believe, is practically impossible for nations to singularly produce and process the environment-friendly technologies. Thus, a combined effort involving non-tariff measures has been largely promoted (Abolhosseini and Heshmati, 2014).

D. IS FINANCING REALLY CONSISTENT? – ROLE OF GOVERNMENT

The importance of policy consistency for renewable energy sector can be observed through the response of households and firms. White et al. (2012) explain how households and firms change their tastes and preferences

quite often. Their ability to translate these likes and dislikes into the most preferred commodity and how much they value one commodity over the other, is famously known as consumer sovereignty. Both the parties make a rational choice and these choices are well-informed for framing their decisions. At this point, the credibility of government's past policies comes plays a huge role in reshaping the decisions of consumers. A firm's choice is also moulded in a similar manner; in conjunction with the budget and laws and regulations imposed (ibid).

Miranda (2010) also charts out the importance of such policy consistency of RE to maintain economic and

environmental order. The study explains the necessity for financial assistance in the RE projects due to their associated large capital investments. The clarity of a policy is another dominant aspect. Without a clear vision for RE policies, it is difficult for decision-makers to determine the amount of government funding that is both necessary and sufficient.

White et al. (2012) also stress on how Mallon (2006) describes the problems and negative consequences associated with an unstable policy. Mallon states that a no policy situation is much better than a situation with unstable policy as it may result in malicious effects on the renewable energy projects and the stakeholders involved; namely consumers and producers. Moreover, they explain as to how the overweighing of negative effects over the positive consequences has mostly dissolved the credibility and reliability of government financing. Naturally, the inconsistent outcomes have also contributed in making the government financing a far-fetched dream. Furthermore, Mallon (2006) cites Germany as a country benefitting from positive and indulging policies and contrastingly U.S. which has been adversely affected by inconsistent policies on renewable energy financing policies. Denmark also faced setback of biogas plants when the environmental and energy policies were restructured (White et al., 2012; Raven and Gregersen, 2007).

Through a detailed literature review of policy consistency, White et al. (2012) also implore the seriousness of stable and flexible policies. It is important for policies to be able to adapt to the emerging technological environment and the perpetually changing markets. The dynamic nature of the markets makes such financing policies more significant and prone to varied effects on the market players. This makes the government support and assistance all the more crucial and consequential. Therefore, the climate finance policies must ensure that new venture capital projects are economically feasible and able to make their own way into the RE market. This support must continue interminably to enable the RE project to develop independently. The frequent and unpredictable policy changes are highly discouraged by authors, as they cause disruptions and discourage any investments and financial support (ibid). A significant gap as identified by Mazzucato and Semienuik (2018) remains in the financing of capital-intensive RE projects that involves huge risks. The authors explore the importance that was traditionally assigned to investing in R&D than promoting the deployment of RE technologies. In addition to this, Bhandary et.al (2021) identify several policy gaps that raise concerns around the consistency of nine major climate finance policies as also discussed through Table 1. The gaps not only depend on the benefits and drawbacks of a certain RE financing policy but also on the data analysis and research undertaken to establish the empirical impacts of these policies. This implies that there is a need for an optimal balance between mobilization effectiveness, economic

efficiency, environmental integrity and equity (ibid). Table 2 helps understand such comprehensiveness within policies that need to be established with a clear aim of improving social welfare.

3.0 Indian scenario

Being one of the major carbon emitters in the world, the necessity for such cleaner measures of energy production have become imperative for India. The renewable energy targets introduced by the Indian government play a vital role in supporting the energy demands of the country as well as cater to the urgent need for establishing a sustainable ecosystem. National Action Plan on Climate Change (NAPCC) as implemented in 2008, is a step towards the development of this renewable energy narrative with a focussed approach to understanding the climatic conditions. It introduces a set of action plans that have been implemented for conservation of resources and enhancing the energy efficiency, as depicted in the Fig.3 (PMF IAS, 2019).

A study by University of Technology in Finland acclaimed the abundant renewable resources that India is endowed with, that can potentially support the energy targets with a well-developed energy system by 2050. Financial contributions to the renewable energy sector are upscaling with 293 global and domestic companies committing to generate about 266 GW of solar, wind, mini hydel and biomass-based power in India. This has raised an investment requirement for \$310 billion - \$350 billion and about \$6 billion is being invested by investment arm of the World Bank Group in multiple sustainable avenues to promote the renewable energy programs in India (Khurana, 2018). In addition to this, an interim target to achieve 175 GW of RE capacity was raised to 225 GW by 2030, to meet the Paris Agreement requirements. More than 94 gigawatts (GW) of electricity has been produced through grid-connected renewable energy (Invest India, 2020). With several global contributions during 2017 and 2018 to improve the green investments in India, the domestic policy environment was observed to be more favourable owing to the technological improvements and tariff reductions. The capital was also significantly raised in the domestic sector and deployed to the RE sector for enhancement of the landscape of green financing in the country (Sinha et. al., 2020). Solar PV growth has been the most remarkable in the previous decade amongst all other renewable sources. The total installed capacity has grown at 7% between 2015-2019, out of which solar PV capacity had a 60% growth rate and wind capacity having 10% growth rate, as depicted in Fig.4 (IEA, 2021). This growth rate has been accompanied with several policy actions, penetrating the growth of grid-connected renewables. The policies, namely, reverse auctions, renewable purchase obligations (RPO), reduced corporate taxes for developers of RE, infrastructural investments and deployment of solar park projects, resulted in decreasing prices of renewables, diminishing development

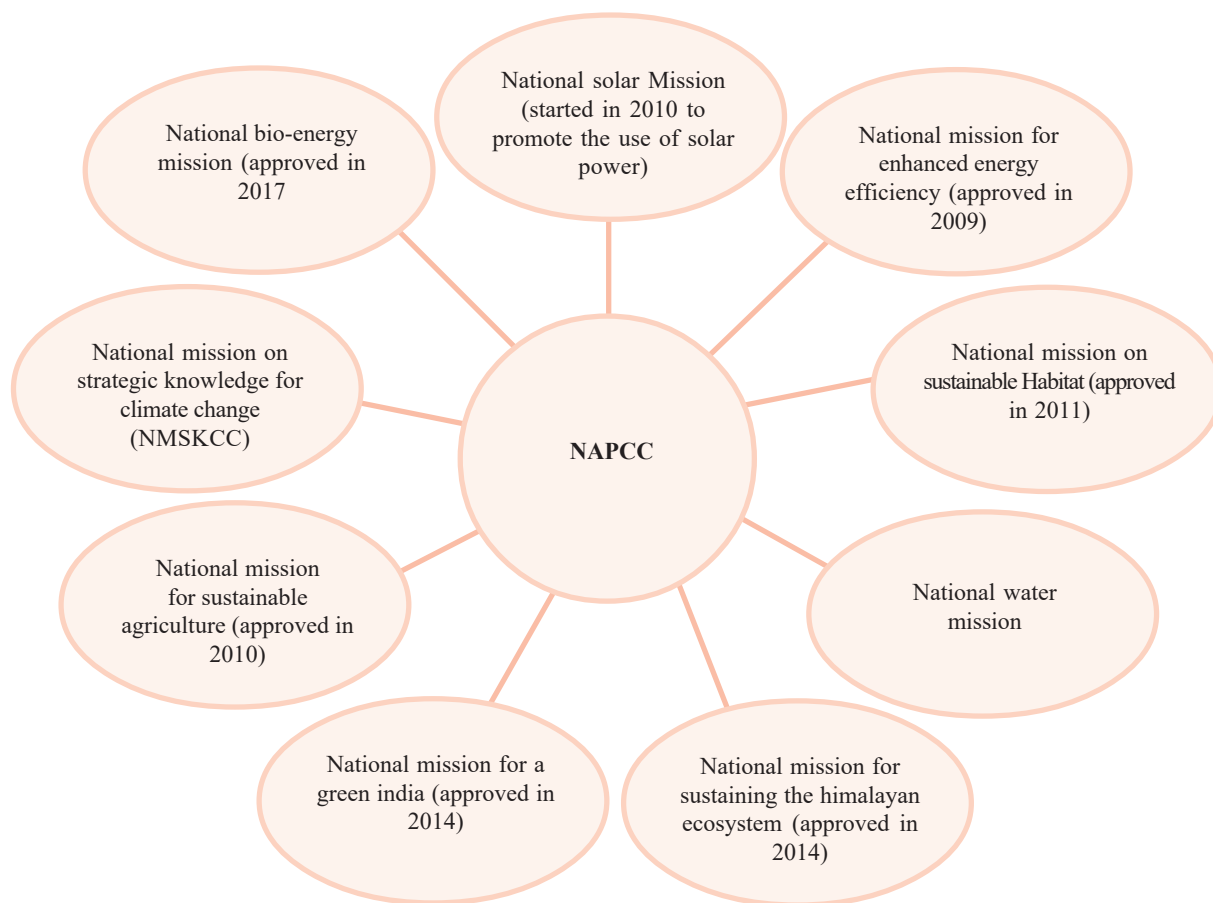


Fig.3: Missions introduced under national action plan on climate change in India

Source: Adapted from PMF IAS (2019), <https://www.pmfias.com/national-action-plan-climate-change/>

risks and a push in renewable power demand. However, many barriers like unstable financing, land acquisition issues, uncertain development in grid infrastructure along with congestion have hindered the RE growth highlighting the instability of structural, regulatory and institutional gaps (IBEF, 2022).

India being the 4th most attractive renewable energy markets in the world, the government is currently targeting for an increased energy capacity of 523GW by 2030. In addition to this the installed power capacity in India has reached around 383.37 GW (as of May, 2021) and the country holds 3rd rank in the list of producers of electricity across the globe. The growing demand for energy and electricity in India has allowed for an emerging renewable energy market in India with pro-active measures from the government of India; planning an installation of 227 GW of renewable energy capacity by FY22. Fig.5 is a representation of the opportunities as offered through the budget of FY22 for meeting the rising energy demands. It also briefly highlights the regulatory support of government of India along with fiscal incentives as introduced in the budget towards renewable energy advancement in India (IBEF, 2022). It is therefore essential that financial assistance is continually offered to steer a robust

growth of India's RE sector with capacity additions and allow for a clean and green growth in India (OECD,2021).

Sarangi (2018), Sinha et.al. (2020) and Gupta (2020), discuss the several investors and investments that play a crucial role in renewable energy financing in India. A wide spectrum of policy instruments and incentives have been introduced by the government of India to keep up with the commitments under the Paris agreement. The thematic structure of the RE policies is associated with the primary need for reduction in GHG emissions as well as recreating a pollution-free environment. Nelson et al. (2012), some relevant schemes and instruments that have been established to finance the green energy sources include green bonds, carbon market instruments like tax, accelerated depreciation (AD), generation-based incentive (GBI) schemes, viability gap funding (VGF), FAME scheme, PLI scheme, etc. (Ghosh et. al., 2021; Krishnaswamy et. al, 2014). Traditionally, the role of government was confined to building a corpus of funds, which has now expanded with the introduction of generation-based incentives and capital subsidies. Additionally, the 'Green Masala Bonds' have been introduced as a financial tool to offer a unique form of financing to capitalise green projects in India. These are usually sold outside India (Gupta,

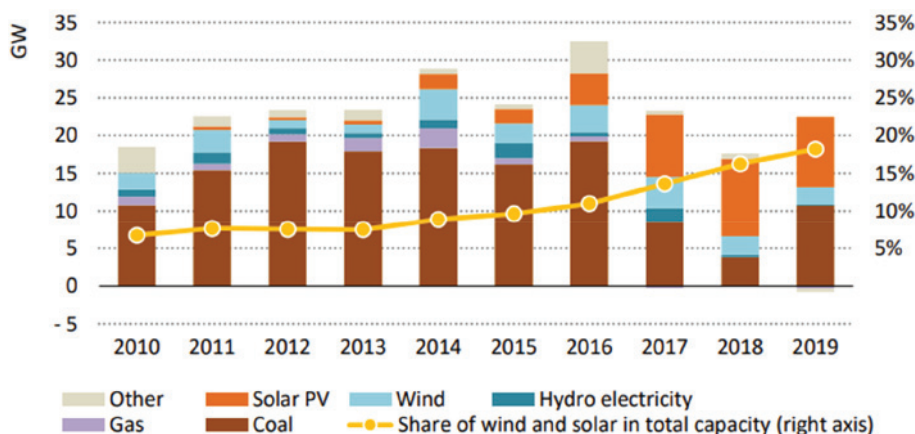


Fig.4: Capacity addition in power sector between 2010 and 2019, measured annually

Source: Adapted from IEA (2021), https://iea.blob.core.windows.net/assets/1de6d91e-e23f-4e02-b1fb-51fdd6283b22/India_Energy_Outlook_2021.pdf

2020).

These policy instruments and incentives are supported through institutional structures that were primarily formed for promoting RE financing on behalf of the government. Organisations like Indian Renewable Energy Development Agency Limited (IREDA), Ministry of New and Renewable Energy (MNRE), Power Finance Corporation (PFC), Rural Electrification Corporation, and National Bank for Agricultural and Rural Development (NABARD) are some of the prominent non-banking institutions hosted by the government. Additionally, there are many banks like State Bank of India, that provide monetary support for the deployment of renewable energy in India. Apart from the government,

private investors also raise capital for the renewable energy projects through equity (Sinha et.al., 2020). However, the significance of the banking and non-banking institutions has been raised by Gupta (2020) to provide instance of government credibility and goodwill in the creation of a renewable ecosystem. The author believes that the government-backed investment projects are focussed on social welfare with an emphasis on the risk-profile of the project; whereas the private investors invest in projects that are concerned with individual benefits and allow them a consistent

access to their invested funds while maintaining their liquidity in long-run (Gupta, 2020). Thus, the organizational structure, created by the government, follows a set of guidelines and rules that are comparatively more useful for funding the renewable energy projects while addressing the commitments of Paris Agreement and contributing to reductions in GHG emissions (Sarangi, 2018).

Following in the footsteps of developed nations and with the international obligations, India has also advanced the deployment of renewable energy as a clean and green model. Kumar and Majid (2020) have appropriately pointed to the possibility of sustainable development with the usage of sustainable energy to promote climate change mitigation,

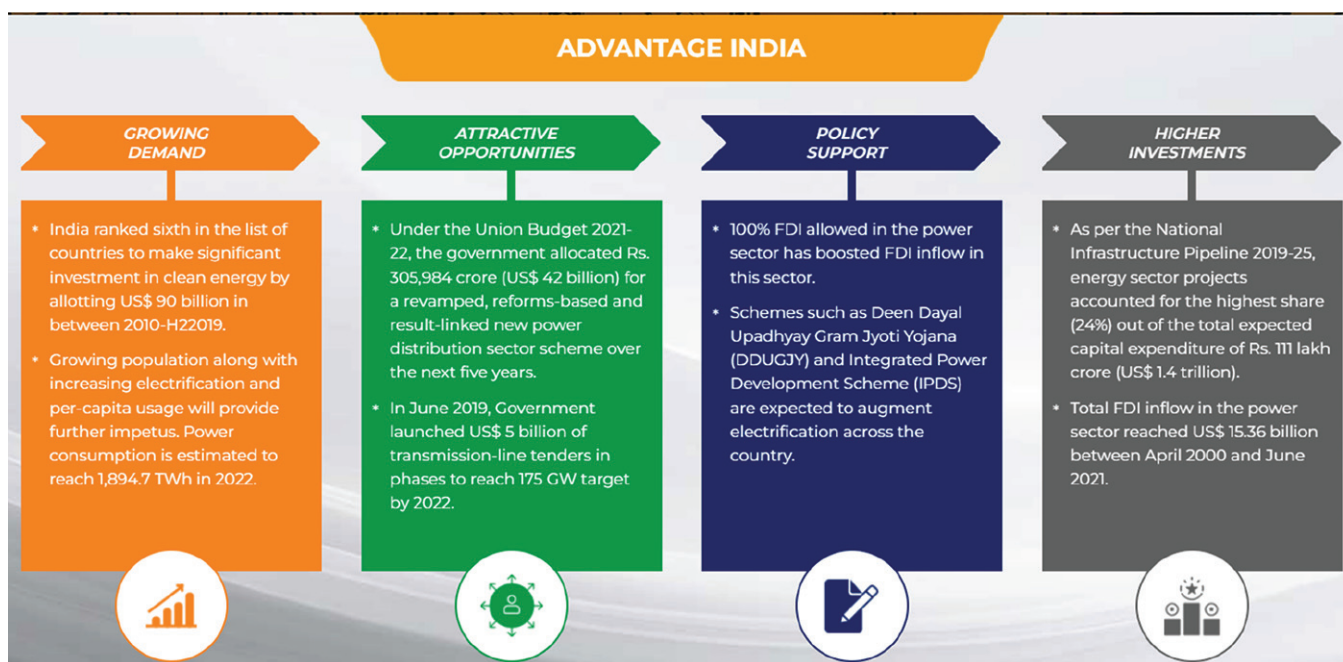


Fig.5: Regulatory and policy structure for renewable energy from the budget, as of 2022

Source: IBEF (2022), <https://www.ibef.org/industry/indian-power-industry-analysis-presentation>

TABLE 3: POLICY AND FISCAL INCENTIVES OFFERED BY GOVERNMENT OF INDIA

Regulatory initiatives		
Initiative	Definition/meaning	Policy mobilization and experience
Feed-in-tariff (FiT)	The government offers a guaranteed price for specific period of time to the producers of electricity, who produce electricity using RE sources.	<ul style="list-style-type: none"> • Even though the revenue risks are ruled out due to guaranteed price from government, uncertainty of guaranteed price may lead to increase in costs to public. • Establishing investor trust in the policy may be difficult due to political instabilities.
Renewable purchase obligation (RPO)	The government offers a guaranteed price for specific period of time to the producers of electricity, who produce electricity using RE sources.	<ul style="list-style-type: none"> • The number of states continuing with such license are substantially less, therefore causing a hurdle. • Another problem is associated with lack in demand given the financial crunch of the distribution companies that are led by states. With penalty being the charge for non-compliance of RPO makes it unattractive to distribution companies.
Renewable energy certificates (REC)	The government offers a guaranteed price for specific period of time to the producers of electricity, who produce electricity using RE sources.	<ul style="list-style-type: none"> • REC were observed between uncertainties during 2017, due to the Central Electricity Regulatory Commissions' decision on reduction in floor and ceiling prices on solar and non-solar REC. • Such regulatory uncertainties have resulted in revenue risks specifically for RE projects dependent on REC.
Fiscal incentives		
National clean energy fund	The fund has been created to support entrepreneurs in undertaking R&D activity for clean energy technologies. Offering a low rate of interest on the funds provided by NCEF to IREDA, the central board of excise and customs collects the NCEF fund.	<ul style="list-style-type: none"> • In the absence of a clear aim and priority, the funds may be ventured to diverse objectives and may have implications for R&D. • Lack of clarity on roadmap and absent feedback mechanism that could be helpful in evaluating the fund and improving. • Structure of the fund seems too broad, inadequate and inappropriate with missing encouragement for fund to be aligned for research and innovation.
Generation based incentives (GBI)	GBI are loans and grants provided by government to support RE initiatives, namely solar power and grid wind. It can be recognized as a means to attract foreign investment in renewables to India. Moreover, large independent power producers were invited to invest and broaden the scope of renewable market for solar and wind.	The primary focus is towards enhancing the renewable energy production than only scaling up the RE projects. Even though such incentives are preferred over FiT, they are not used for utility-scale projects as tariffs fell dramatically with rising RE markets in India.
Viability gap funding (VGF)	It is a corpus of funds raised by the central or state governments for financing the solar projects in India. VGF can be termed as a capital subsidy or grant or equity that helps in keeping the project cost within a close proximity to developer's price. This allows for reduced financing cost with capital being partially available for use directly.	VGF is currently only used for solar projects by SECI. Being a new form of incentive compared to GBI, these are offered only once. But this funding has been 'either redesigned or downscaled' due to the falling renewable energy prices in the country.
Production-linked incentive (PLI) Scheme	Government has designated institutional support in funding the domestic manufacturing of renewable energy sources. The Scheme envisions to make India into a leading RE hub across the globe. 4%-6% of incentive is offered to the manufacturers over their incremental sales for manufacturing in India.	While it is still in its nascent stage and may require some time before any evaluations are undertaken, however, it withholds the risk of being evoked for non-compliance of WTO guidelines. This may also create distrust among manufacturers in the initial phases and the concerns would need to be addressed allowing transparency and clarity.

Source: Created by author using PIB (2011), Pandey et.al. (2013), SSN, (2013), Resurgent India (2015), Sarangi (2018), TOI (2018), Bhattacharjee and Naik (2021), GOI (2022), Ministry of Electronics and Information Technology (2022).

improve energy security and an easy access to energy; moreover, ensuring affordable, reliable, sustainable and modern energy for the public. To ensure the effectiveness of such policies, a vigorous government support has helped in improving economic situation. Further, this has complemented in the attraction of renewable energy markets from across the globe to India. The policies and liberal work environments to attract foreign investment have been on a rise; eventually leading to the rapid growth rate in the renewable energy market (Kumar and Majid, 2020). This support from government has been due to the anticipation of strength of this sector in providing for the citizens of the nation. Literature has emphasised on the importance of government funding for RE projects, that continues to withhold an innovation challenge. Therefore, it has become imperative to develop novel RE policies with clarity and soundness to push to the potential upcoming RE projects in India (Gupta, 2020). Select few policy and fiscal incentives have been explained through Table 3 to explore this macroeconomic structure with the challenges associated for RE regulatory structure in India.

The policy actions are still associated with several challenges, as listed below, that affect the potential of renewable in the Indian energy market and would need a thorough revision.

1. Cost and finance: Budgetary constraints in regard to the fund allocation and high initial cost of renewable energy project have been a major hurdle in the rapid growth of renewable energy market (Kumar and Majid, 2020).
2. Governance, regulation and implementation: Proper monitoring and regulation at NCEEF is proving to be an issue (Gupta, 2020). Hence, a restructuring of institutional structure would be advisable for boosting investment in renewable ecosystem in India. In addition to this, a continuous coordination would be necessary between the different tiers of government to effectively introduce and implement a policy action. Presently, the political instability in India does not allow this to happen at different levels and the variation in political structure at state level has not been aligned with central targets, causing disruptions (Sarangi, 2018; Kumar and Majid, 2020).
3. Lack of comprehensive policies: With an adequate regulatory and institutional environment for renewables in India, a set of comprehensive policy instruments and actions would be essential to mirror the anticipated development of renewable energy, that is currently full of uncertainties. Uncertainties also let the changes in prices emerge in spotlight coupled with the currency exchange rates. With the efficiency also varying across states, the government funding is prone to be wasted. Even the novel taxation policy of the Goods and Services Tax (GST) has been claimed to dampen the investor's interest in

Indian renewable energy markets (Gupta, 2020).

4. Transparency and information: The absence of transparency in subsidies and incentives and further a sharp fall in tariffs in 2018 has portrayed a major challenge for financing the renewable energy projects in India. Underlying uncertainty, lack of technological awareness and high-risk perception diminishes the investors interest, specifically the government (Kumar and Majid, 2020).

4.0 Conclusions

The renewable energy sector offers huge potential for an inclusive and sustainable growth of economies. But the presence of certain notable hurdles might hinder the progress in this sector. Sinha et.al (2020) suggests for an effective mix of instruments with a need to recycling the deployed capital from existing to new RE projects. The report also suggests an adoption of solutions like enhanced default protection and develop the risk-transfer mechanism to enable stable fiscal investments in renewables while additionally improving the bond markets in India. Kumar and Majid (2020) suggest the adoption of a hybrid configuration of two or more resources along with the conventional sources. They believe that it would help accomplish the idea of a reliable system with the regulatory authority support. Thus, that there is a need to strategize investment structure and carefully examine the prospective projects for inviting government support and lead the way. Adequate infrastructure, skilled workforce and collaborative agreements will largely assist in acquiring the government funding (ibid).

“India has plenty of renewable energy to bridge the gap between demand and supply so we must persistently put in efforts to harness various forms of renewable energy sources with the use of newer technologies to form a clean and safe place for our coming generations.” (Khurana, 2018)

Abbreviations

- AD– Accelerated depreciation
- FAME – Faster Adoption and Manufacturing of Electric and Hybrid Vehicles in India
- FiT – Feed in Tariff
- GBI – Generation Based Incentive
- IBEF – India Brand Equity Foundation
- IEA – International Energy Agency
- IREDA – Indian Renewable Energy Development Agency Limited
- MNRE – Ministry of New and Renewable Energy
- NABARD – National Bank for Agricultural and Rural Development
- NAPCC – National Action Plan on Climate Change
- PFC – Power Finance Corporation
- PLI – Production-Linked Incentive Scheme

RE – Renewable Energy
REC – Renewable Energy Certificates
RPO – Renewable Purchase Obligation
VGF – Viability Gap Funding

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