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Cross-Country Studies: India

KfW's Support for India's Green Energy Corridors
GCF Line of Credit for Solar Rooftop PV deployment in India

April 2020

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Cross- Country Studies: India

Transformative Impact of International Climate Finance on Domestic Policy Frameworks and Climate Goals

Case Study 1:

KfW's Support for India's Green Energy Corridors

Case Study 2:

GCF Line of Credit for Solar Rooftop PV deployment in India

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INTRODUCTION

India plans to achieve about 40% cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology and low cost international finance. In this regard, India is targeting the installation of 175GW of Renewable Energy (RE) capacity by 2022¹ as a first step. This ambitious target includes 60GW of large and medium-scale grid connected solar power projects, 60 GW of wind, 40 GW of solar rooftop projects, 10 GW of bio-power and 5 GW of small hydro. India's INDC also aims to reduce the emissions intensity of GDP by 33 to 35% from 2005 levels by 2030².

Prior to submissions of these commitments under the Paris Agreement, India had introduced the National Action Plan on Climate Change (NAPCC) in 2008 to develop the future policies and programs for climate change mitigation and adaptation. NAPCC serves as the government's blueprint for its initiatives that address climate change. The core of NAPCC are the eight National Missions, i.e. National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Water Mission, National Mission for Sustaining the Himalayas, Green India Mission, National Mission for Sustainable Agriculture and National Mission on Strategic Knowledge for Climate Change.

According to a 2018 assessment by the Climate Action Tracker, India is expected to overachieve its targets, which were rated to be 2 degree C compatible, with its current policy framework.³

However, there are some major roadblocks arising that act as barriers to India achieving its climate goals through its planned implementation of its energy targets. These range from political barriers such as non-compliance with regulations pertaining to climate action and lack of political will; economic barriers such as huge capital requirements, inadequate international financing and lack of mechanisms to compute and manage financial risk; and other risks like execution risk and operational risk due to lack of capacity, which together serve as major barriers in the energy sector.⁴

Regulatory risk exists in terms of the uncertainty among investors pertaining to the policy landscape in the sector. The presence of financial hurdles can be attributed to weakly developed financial markets, which further exacerbate the lack of flow of international funds into the energy sector. Underdeveloped Indian institutional investment bodies, the lack of viable project financing instruments and the immature debt capital markets further add to weaken the financial structure.

Further, according to an IFC study, India requires USD 404 billion annually, to meet its RE target under the Paris Agreement,⁵ i.e.: 40% of total electricity generation from non fossil fuel sources by 2030. This translates to required investments of approximately USD 31 billion annually, while India was only able to garner around USD 10 billion as annual RE investments in the 2013 – 2017 period⁶. This points to the huge gap in required finance for meeting the country's ambitious plans for ramping up RE and moving to a low-carbon pathway.

¹ Press Information Bureau, Government of India (2017). Available at: <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1514215>

² Ministry of Environment, Forest and Climate Change, Government of India (2015). Print release accessible at: <https://pib.gov.in/newsite/printrelease.aspx?relid=128403>

³ <https://climateactiontracker.org/countries/india/>

⁴ https://www.orfonline.org/wp-content/uploads/2017/12/ORF_IssueBrief_214_GreatWallsDomestic.pdf

⁵ IFC (2017). Climate Investment Opportunities in South Asia.

⁶ BNEF (2018). Global Trends in Renewable Energy Investment.

With this background, in an attempt to better understand some of the successful models which have emerged which leverage international climate finance to strengthen the implementation and overcome the finance barriers, in this report we have assessed two specific and distinct cases:

- 1) A large nation-wide public infrastructure project - the development of power transmission network through Green Energy Corridor project; and
- 2) Mobilizing the domestic private sector for the creation of rooftop solar photovoltaic (PV) power capacity across the nation.

The chapter tries to assess the transformational change that the international funding for the two projects resulted in, on the basis of the impacts in form of processes and outcomes. To understand this interaction between climate finance and impacts, hypotheses were developed, that specifically analyse the transformational impact of these case studies.

The hypotheses are developed in terms of the processes of the case study, and the transformational change is then further understood under the given three categories, leading to the desired outcome.

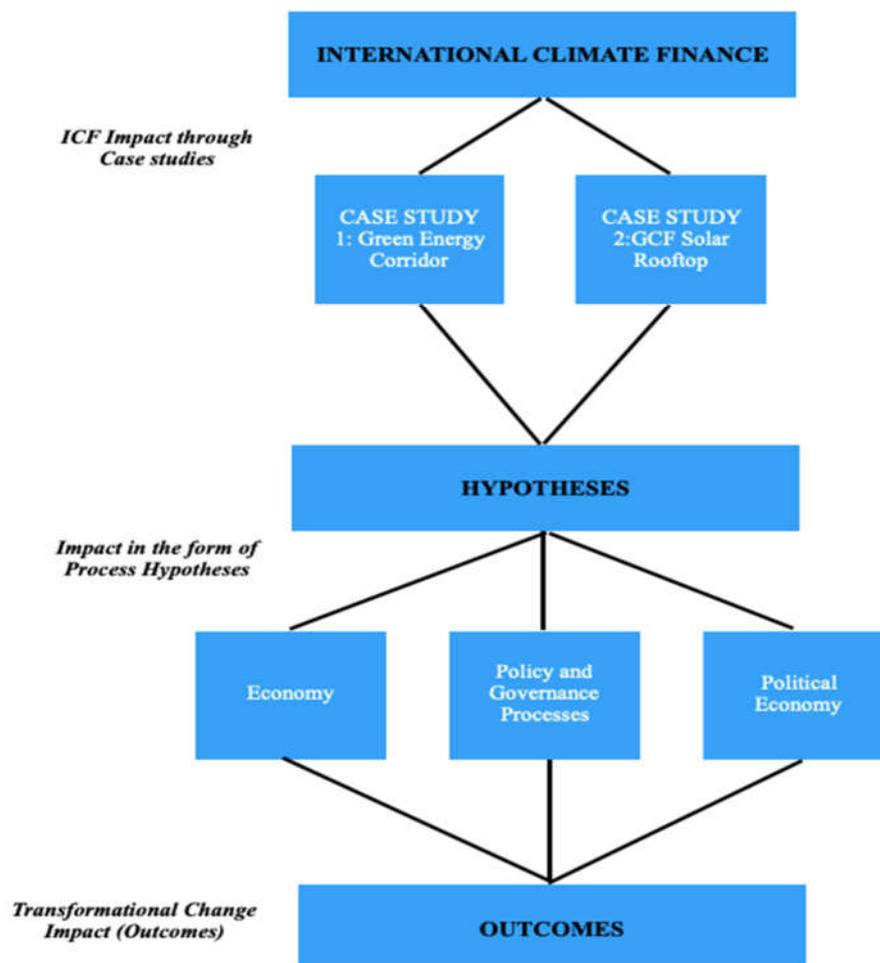


Figure1: Transformational change assessment

Case Study I: KfW’s Support for India’s Green Energy Corridors

Brief Overview of the Project	
Information	Description
Title of Project	Green Energy Corridors (phase-I)
Action Area	Mitigation
Focus Area	Financial and technical assistance
Objectives of Project	Strengthen, develop and create a reliable transmission infrastructure to accommodate the increasing amounts of generation from RE sources into the national grid.
Geographic Coverage	India
Level of Project	National and select States
Sectors targeted	Renewable energy/ Transmission infrastructure
Implementing/ Funding Entity	
International Climate Finance Type	Bilateral support from Germany, through the German Federal Ministry for Economic Cooperation and Development (BMZ).
International Funding Entity	KfW Development Bank (KfW) provided soft loans of around 1 billion euros
Implementing Entities	<ul style="list-style-type: none"> • Power Grid Corporation of India Ltd (PGCIL) • State Utilities in each of the eight project states
National Designated Authority and Domestic Funding	Ministry of New and Renewable Energy (MNRE)

Background

India’s goal of 175 GW of RE capacity by 2022 raises significant technical challenges for national grid management due to the intermittent and variable nature of RE generation. This comes along with the existing challenges India faces related to its weak and inadequate transmission infrastructure, seeing a surge in energy demand. According to the Central Electricity Authority (CEA) of India, in the 2017-2022 period, around \$39 billion is required to upgrade and develop India’s transmission system.⁷

Further, around 60% of India’s RE potential comes from seven of its 29 states, requiring new and additional networks, sub-stations and transmission lines for transferring the RE power from those

⁷MERCOM (2019). Article: India Needs to Spend \$39 Billion on Transmission Infrastructure Revamp.

states to where they are needed.⁸ To address this, the Government of India in 2013 launched a National Green Energy Corridor Programme to enable the flow of RE into the National Grid Network. So that, using Green Energy Corridors (GEC) the intra-State network will feed the RE generated to the respective State grids, with the high capacity transmission corridors being developed for the inter-State network, to further connect the State grids to the national grid.⁹ The project was envisaged by the Power Grid Corporation of India Limited (PGCIL), which is a state-owned company engaged mainly in transmission of power. PGCIL initially estimated the cost of GEC to be over USD 5 billion.¹⁰

Under the first phase of this programme, a Green Energy Corridors (GEC -I) project was conceptualized, as a comprehensive scheme for evacuation of RE generated power from the major RE pockets and its smooth integration into the national grid. In GEC-I, development of the transmission system and control infrastructure for the addition of RE capacity in eight of the renewable rich states was planned. The project's primary aim is to create Intra-State and Inter-State transmission systems to enable the transfer of the planned RE capacity addition in these States for further distribution. The project also proposed for setting up a Renewable Energy Management Center (REMC), along with the required control infrastructure, to coordinate across the state and national level load despatch centres for maximizing the RE generation and integration potential, without compromising security and stability of the power system. The REMC's will thus, ideally be set up within the relevant Load Despatch Centres (LDC). They would also be the focal point for RE forecasting and dispatching, and be responsible for real-time measurement and information flow.¹¹ The project is currently under implementation in eight states- Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Maharashtra, Rajasthan, Madhya Pradesh and Tamil Nadu.

GEC-I faced several delays, and its planned completion has gradually moved from 2017 to the end of 2020.¹²

Key Barriers

Key barriers which led to delays in the implementation of the GEC-I Project are:

1. The project has massive upfront investment requirements, but due to the constrained national budget, was underfunded, with viable capital not being available at the right time.
2. There were fundamental issues such as the acquisition of the required land and right-of-way agreements with the landowners and farmers, which delayed different parts of the project.
3. The required centralized oversight, monitoring and evaluation and redressal part of the programme was not adequate for this ambitious, national level, large-scale infrastructure project. For instance, the project had to compile with legal requirements under several national Acts,

⁸KfW(2017). Indian Green Energy Corridor. Available at: https://www.kfw-entwicklungsbank.de/PDF/Entwicklungsfinanzierung/Issues-NEW/Indian_Green_Corridors_2017.pdf

⁹It should be noted, that the inter-State transmission infrastructure are to be developed by central transmission utilities and the intra-State by State transmission utilities.

¹⁰National Electricity Plan. Available at: http://www.cea.nic.in/reports/committee/nep/nep_jan_2018.pdf

¹¹Power Grid Corporation of India Ltd. (2012).

¹²Article: Nearly 10 GW of Renewable Capacity Added to Green Energy Corridor: RK Singh. MERCOM (Sept. 2019). Available at: <https://mercomindia.com/renewable-capacity-green-energy-corridor/>

such as the Forest (Conservation Act), 1980; the Wildlife (Protection) Act, 1972; Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016, etc.¹³

To help India achieve its RE and global climate goals, Germany entered a partnership with India -the five-year Indo-German Energy Programme (IGEN), in 2015 (this followed the 2013 joint declaration of intent to accelerate the use of RE in India). A main emphasis area of this partnership is the GEC projects, along with various other RE components. For this case study, we are focusing on Germany's support to India for the GEC-I project (2013-2020), which sought to address the above-mentioned barriers.

International Climate Finance from Germany for India's GEC-I Project

With the aim of helping India bring more RE capacity to its grid, the German Federal Ministry for Economic Cooperation and Development (BMZ) is supporting the GEC-I project, through an agreement with India's MNRE, with KfW Development Bank as the finance partner, with GIZ supporting the project as the implementing technical partner.¹⁴ Under this, KfW gave concessional loans of around 1 billion euros (500 million euros to the inter-state transmission projects and around 488 million euros to six different states under separate agreements for intra-state transmission projects)¹⁵, playing an instrumental role in addressing the financial barriers the project faced, by significantly lowering the cost of financing required to implement the project.¹⁶ The overall amount committed to GEC projects by KfW till date is around 1.4 billion euros.¹⁷

OBJECTIVES

The goals of the three main components of GEC-I are as follows:

1. **Inter-State Transmission System:** Building approximately 3200 ckm of transmission lines and 18000 MVA of substations;
2. **Intra-State Transmission System:** Building approximately 9400 circuit kilometres (ckm) of transmission lines and nearly 19000 Mega Volt-Amperes (MVA) of substations; and
3. **Renewable Energy Management Centres:** Establishing REMC's at the selected State LDC's and the National LDC, and also enabling them with the technical capacity and tools to undertake their defined role.

¹³ GEC- Environment & Social Safeguard Monitoring Report (2017). A version available at: <http://apps.power-gridindia.com/POWERGRID/docs/ENVIRONMENT/KfW%20Monitoring%20Report/Safeguard%20Monitoring%20Report%20Jan-June%202017.pdf>

¹⁴ GIZ website: <https://www.giz.de/en/worldwide/15767.html>

¹⁵ Ministry of Power's Press Release (December 2016). Available at: <https://pib.gov.in/newsite/PrintRelease.aspx?relid=155455>

¹⁶ Note: Total KfW funding for the GEC projects is ~1.4 billion euros as concessional loans, of which ~1 billion euros is for GEC-I.

¹⁷ While GEC-I was still ongoing, a second phase of the project - GEC-II, was also announced in 2015, focusing on connecting solar parks in 21 different states with the national grid. This would be beneficial for the RE sector in India, where companies till now were facing an uncertain future with little clarity on how they can integrate effectively with the national grid, due to lack of sufficient transmission capacity. GEC-II is slated to be complete by end of 2021 and also has KfW supporting certain project components. A GEC-III is also envisaged, but its details are still to be announced, with possible additional funding from KfW and other international investors and funds. (Source: *Energy Forum - Newsletter* (April 2019). *IGEF Subgroup IV meeting on "Green Energy Corridors"*.)

KEY ACTORS AND FINANCIAL MODEL

The GEC programme is being implemented by the MNRE, as part of its national drive to accelerate the adoption of RE and integrate this capacity effectively with the country's energy systems. GEC-I is being implemented in eight renewable rich states as well as with the central government for the national grid. As mentioned above, the project has three key components:

1. **Inter-state Transmission:** The state-owned entity, responsible for the transmission of energy in India, PGCIL is the implementing entity and is developing the inter-state transmission corridor, while the state transmission utilities of the eight renewable rich project states (Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Maharashtra, Rajasthan, Madhya Pradesh and Tamil Nadu), are responsible for setting up and strengthening the intra-state transmission infrastructure.
2. **Intra-state Transmission:** This project component was sanctioned in FY 2015-16, is monitored by the MNRE through a Project Appraisal Committee (PAC) formed under chairmanship of concerned Joint Secretary, with members from the Central Electricity Authority of India and PGCIL. The committee monitors the project & recommends on the disbursement of central grant to the specific state utilities.
3. **Renewable Energy Management Centres:** For this component of the project, PGCIL has been appointed as the Project Management Consultant (PMC). It is being established through a sanctioned budget of nearly 50 million euros (Rs. 409 crores¹⁸) by the Indian Ministry of Power. Technical assistance for this component is provided by GIZ, as part of the IGEN programme.

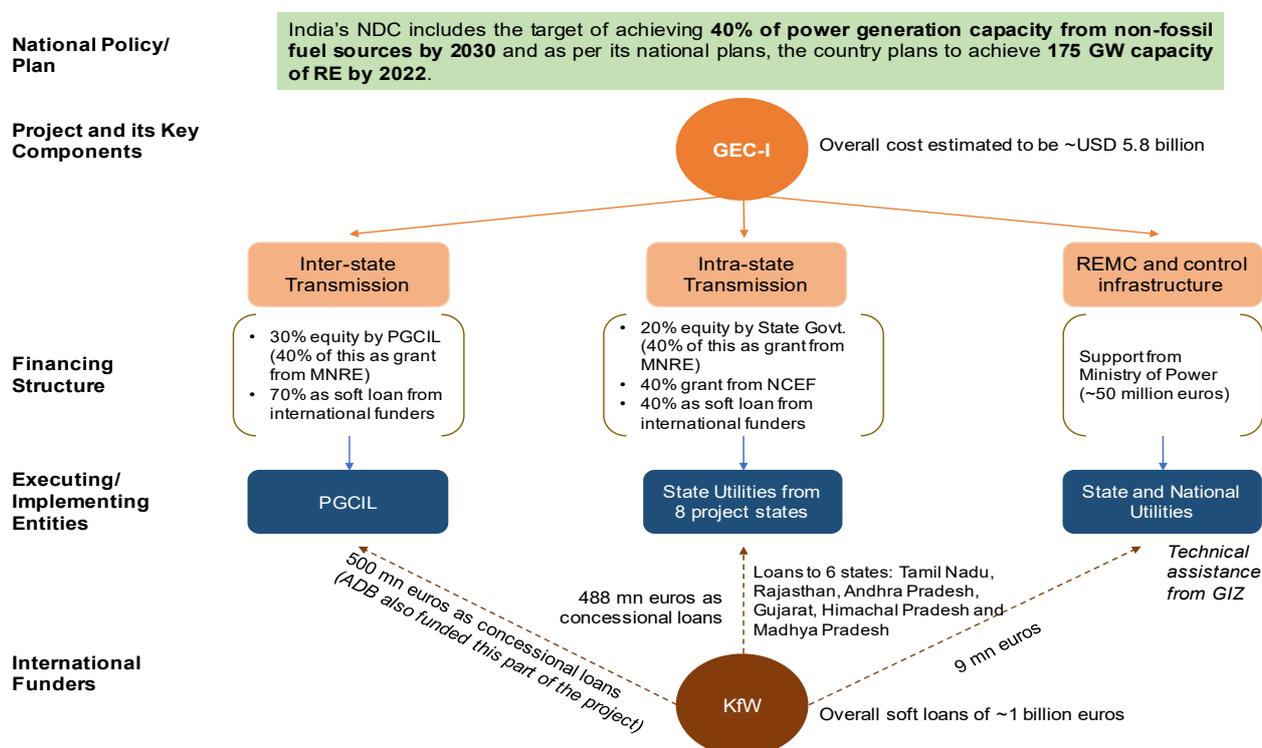


Figure 2: GEC-I project components, key actors and finance flows from KfW¹⁹

¹⁸Based on Exchange rate prevalent as on 11th March 2020: 1 Euro= Rs. 83.4; used throughout the case study.

¹⁹ Ministry of Power press release (<https://pib.gov.in/newsite/PrintRelease.aspx?relid=155455>); Financial Express Article (Feb 2020) (<https://www.financialexpress.com/industry/govt-invites-germanys-state-run-kfw-to-fund-transmission-projects/1873504/>)

The current estimated cost of Intra-State and Inter-State transmission systems is 1.6 billion euros (Rs. 12,693.94 Crores) and approximately 2 billion euros (Rs. 15,455 Crores), respectively. The funding for the project has been planned as mix from the central government and national funds, relevant Indian corporates, state utilities, and multilateral financial institutions - namely KfW and ADB. The financial allocation within India has been sourced from the National Clean Energy Fund (NCEF), through the MNRE.

For Inter-state transmission component, the total project activities have been split into Parts A, B, C and D as per finance requirement and timelines. KfW provided concessional loans of 500 million euros to PGCIL for Part A, B and C, while Asian Development Bank (ADB) provided a concessional loan of USD 1 billion for Part D to PGCIL (comprising of Sovereign guaranteed loan of USD 500 million and Non-Sovereign loan of USD 500 million)²⁰.

For the Intra-state Transmission component, the grant from the central government is disbursed in two installments to the state utilities, 70% Advance on the award of contract, and balance 30% after successful commissioning and three months performance testing. The break-up of the 488 million euros total funding provided by KfW to six of the eight project states is depicted in Table 1.

Serial Number	State	Amount of soft loans provided
1	Tamil Nadu	76 million euros
2	Rajasthan	49 million euros
3	Himachal Pradesh	57 million euros
4	Andhra Pradesh	68 million euros
5	Gujarat	114 million euros
6	Madhya Pradesh	124 million euros
	Total	488 million euros

Table 1: **Funding for Intra-state transmission projects by KfW**

POLICY LINKAGES

RE is a critical climate goal as well as a developmental aspect of the energy poor country, where till very recently 250 million people lacked access to reliable electricity in their homes. Through the National Solar Mission, which is a component of its National Action Plan on Climate Change (2008),

²⁰ Business Standard (2016). Article accessible at: https://www.business-standard.com/article/news-cm/pgcil-seeks-us-1-000-million-loan-for-green-energy-corridor-from-adb-116111800174_1.html

the Government of India introduced its first comprehensive initiative to develop policies and programs for enhancing RE capacity. Further, India set itself the target of installing 100 GW of solar energy capacity, as a part of 175 GW of RE capacity by December 2022.

To achieve this, various policies and programmes aimed at significantly increasing the generation as well as the adoption of RE in the country have been introduced.²¹ As mentioned earlier, India’s NDC also includes the goal of cumulative 40% of generating capacity from non-fossil fuel sources by 2030. As per India’s NDC, its RE target’s achievement is dependent on adequate support from the international community, assuming an effective international architecture for quick diffusion of cutting edge climate technology in India and for joint collaborative R&D for such future technologies.

The GEC project plays a crucial role in achieving these goals by enabling the integration of the generated RE capacity in to the country’s power systems, by leveraging international climate finance to make viable funding accessible.

Current Status

The infrastructural development under the GEC had initially been slow and not at par with the expected deadline of March 31, 2018. However, the work on the project was ramped up with the new deadline being the end of 2020.

According to Mr R K Singh²², the Minister of Power and New and Renewable Energy, as on July 5, 2019, 2168.2 ckm (23% of target) of transmission lines and 4757 MVA (25%) of substations under **Intra-State Transmission System** (See Table 3), and 2467 ckm (78%) of transmission lines and 13000 MVA (72%) of substations under **Inter-State Transmission System** have been completed (See Table 2). As per PGCIL, the establishment of the GEC under Inter-State Transmission System has already enhanced the cumulative Inter-Regional National Grid Capacity to about 100 GW²³.

S. No.	State	Length of Transmission Lines in circuit kilometres (ckm)	Substation capacity in MVA
1	Rajasthan	1477	6000
2	Gujarat	942	6000
3	Tamil Nadu	48	1000
	Total	2467	13000
	Project Goal	3200	18000

²¹ <https://pib.gov.in/newsite/PrintRelease.aspx?relid=179768>

²² Current progress of the GEC project provided in response to a question asked in Lok Sabha Meeting. <http://164.100.47.194/loksabha/questions/QResult15.aspx?qref=3229&lsno=17>

²³ <https://www.saurenergy.com/solar-energy-news/10-gw-re-capacity-added-under-green-energy-corridor-rk-singh>

Table 2: Progress under Inter-State Transmission System as on July 05, 2019

Table 3: Progress under Intra-State Transmission System as on July 05, 2019

S. No.	Project State	Length of Transmission Lines (in ckm)	Substation capacity (in MVA)	Capacity Addition (in MW)
1	Andhra Pradesh	278.20	315	613
2	Gujarat	325.30	800	668
3	Himachal Pradesh	8.00	-	40
4	Karnataka	231.00	1000	1532
5	Madhya Pradesh	434.20	612	4593
6	Maharashtra	87.50	-	865
7	Rajasthan	522.00	1000	1100
8	Tamil Nadu	282.00	1030	850
	Total	2168.20	4757	10261
	Project Goal	9400	19000	

Transformational Change Assessment

This chapter will try to assess the transformational change that the international funding for the GEC project has resulted in. The transformational change will be assessed on the basis of the hypothesis mentioned underneath.

Hypothesis 1: Provision of international climate finance plays an important role in strengthening the programme design by bringing together a range of key actors, which can raise the climate ambition of developing countries.

Mobilization of finance for investment, effective institutional mechanisms and innovation in the RE sector is a key challenge for climate change mitigation. Energy transition in developing countries, which are rich in RE resources, depends on the provision of affordable finance, adequate infrastructure and regulatory support mechanisms. Viable infrastructure is a primary challenge for many countries, including India, where issues ranging from a lack of transmission network to inadequate access to affordable finance for building the infrastructure, can impede RE growth. This makes the role of international climate finance along with the required technical assistance, critical. In this regard, the

financing provided by KfW and ADB for GEC-I project has supported development of infrastructure gaps, while also bringing together the relevant actors and developing their capacities to address technical roadblocks.

International climate financing often requires the key nodal government bodies to be closely involved and responsible for the project. In this case, the Indian Ministry of Power (MoP) and MNRE were closely engaged with, as was the state-owned PGCIL and the state utilities from the project states. This itself was a feat, to get these distinct bodies together to address their common issues, which may not directly fall under the mandate of either one of these entities alone. The access to affordable finance and the direct benefits these actors were able to foresee, also ensured their active participation. Through a separate project component, the State Load Despatch Centres (SLDC's) and the National Load Despatch Centres (NLDC's) was also brought on board, with a focus on ramping up their capacity and establishing uniform processes, which will allow smoother interactions going forward.

The enlistment of these separate entities, through structured project activities, with processes in place for systemic learning, acted as a catalyst for this large public infrastructure project.

Hypothesis 2: Provision of international climate finance plays an instrumental role in driving institutional innovation and enhancing capacity.

This hypothesis intends to throw light on role played by international climate finance in improving governance processes and in enhancing capabilities. Learning how to access and effectively use international financing options represents a crucial step in a developing nation's long-term transition to climate-resilient development pathways. It requires considerable efforts by the country receiving such funds to put in place the necessary policy, technical and financial means to mainstream climate change considerations into the RE sector and provide the basis to shift to low-carbon economy. Establishment of REMC's equipped with state-of-the-art RE forecasting & monitoring systems, as envisaged as part of GEC project, has resulted in monitoring and evaluation (M&E) capacity building of PGCIL and STU's through adoption of global best practices to facilitate grid integration of RE.²⁴

In India, existing control centres lacked RE forecasting systems, scheduling, monitoring and reserve management abilities. To alleviate this problem, the implementation of the REMCs as a Central Scheme has been approved by the Government of India. The planning and formulation of 11 REMCs under the project have placed India among a league of few nations, which have such state-of-the-art management centers for RE integration. The REMC's are equipped with Artificial Intelligence based RE forecasting and scheduling tools and provide greater visualization and enhanced situational awareness to the grid operators. As per the new plans, the REMCs would be separated into the Southern, Western and Northern regions across the seven major resource rich states and various projects of the GEC project. These REMCs are being managed by Power System Operation Corporation of India Ltd. (POSOCO) at Regional and National level and at State level by SLDCs.

²⁴ Ministry of Power's office memorandum (2017). Accessible at: (https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKewj6mcCynufuAhUO7XMBHSNTAcUQFjAAegQIARAB&url=https%3A%2F%2Fpower-min.nic.in%2Fsites%2Fdefault%2Ffiles%2Fwebform%2Fnotices%2FSFC_proposal_for_establishment_of_renewable_energy_management_centre_1.pdf&usq=AOvVaw1KVHiQJwJur9UOTryBuGKf)

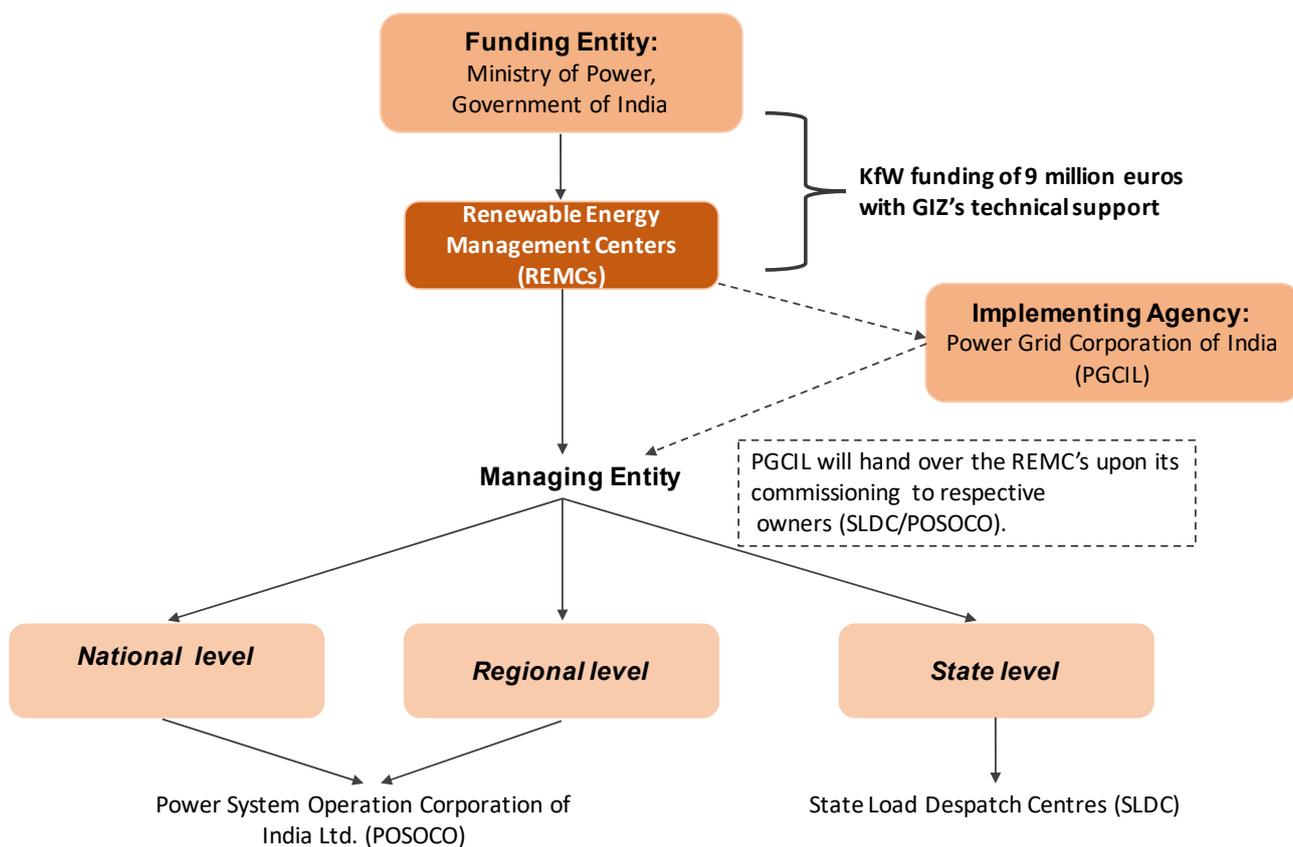


Figure 3: Renewable Energy Management Centres²⁵

The mobilisation of funds from multilateral funding entities for GEC Project have resulted in transformational change by requiring a high degree of transparency, improved governance processes, and the need for a robust monitoring system in place. For instance, the work under intra-state transmission network under the GEC project is allocated through a competitive bidding process. The progress of the allotted work is monitored by the MNRE regularly and publically disclosed. A Project Appraisal Committee regularly monitors the project & recommends on the disbursement of the central grant to the state utilities. In regard to the REMCs, PGCIL which had already worked on similar control centre projects in the past, has been assigned the implementation role. On completion, PGCIL will hand the REMCs over to the states.

Hypothesis 3: Provision of international climate finance facilitates high-level political intervention, which can hasten implementation of complex national level infrastructure projects.

This hypothesis showcases how large scale international financing for the GEC project can play a crucial role in bringing about high-level political intervention to make sure that the project is on the right track and it meets its proposed deadlines. This is especially the case where the output is a tangible public infrastructure good. For instance, India and Germany, following wide-ranging discussions between India’s Prime Minister Narendra Modi and Germany’s Chancellor Angela Merkel,

²⁵ Ministry of Power press release (<https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1604689>); Ministry of power’s office memorandum (https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKewj6mcCyn_ufoAhUO7XMBHSNTAcUQFjAAegQIARAB&url=https%3A%2F%2Fpower-min.nic.in%2Fsites%2Fdefault%2Ffiles%2Fwebform%2Fnotices%2FSFC_proposal_for_establishment_of_renewable_energy_management_centre_1.pdf&usq=AOvVaw1KVHiQJwJur9UOTryBuGKf)

took a giant step towards clean energy collaboration with the creation of long-term 'Climate and Renewable Alliance' on 5th October 2015. With a long term vision and a comprehensive agenda of cooperation, the alliance resulted in Germany extending a lump sum assistance of over one billion euros for India's GEC and a new assistance package of over a billion euros for solar projects in India.²⁶

Against such a backdrop, provision of international finance for GEC project further facilitated high level political intervention to ensure hassle-free implementation of the project. In November 2019, following project delays, Prime Minister Narendra Modi intervened to resolve the various issues of land, right of way and forest clearances that were hampering the implementation of the project. He tasked the Cabinet Secretary Rajiv Gauba to work with the state governments and the Ministries and immediately resolve the issue of land required for the projects within 10 days. With the Cabinet Secretary deputed to resolve such issues, the progress of the project gradually picked up. The Prime Minister also directed the state governments to resolve such issues expeditiously and appealed to them and the MNRE to speed up execution for early completion of the project.

Moreover, to further oversee the project, the Indian Parliament's Standing Committee on Energy was given the mandate and is actively involved in evaluating the progress of the GEC project. The committee also provides recommendations to give the desired thrust to the project for its proper implementation, tasked with highlighting the gaps and the roadblocks these face. The committee in its 39th Parliamentary report, titled "Demands for Grants of the Ministry of New and Renewable Energy (MNRE) for the year 2018-19" pointed out that the funds available to support the program had increased in that fiscal year. The committee also highlighted the mismatch between the year's goal and the funds allocated. Recently, in March 2020, a Parliamentary panel conducted an assessment and found the project achievements to be unsatisfactory in relation to the goals and timelines set, expressing their displeasure with the MNRE for missing deadlines. It asked the Ministry to identify lag areas and take corrective actions on "mission mode," without any further delay. Such public interventions put the required pressure to keep these projects advancing.

The provision of international climate finance has significantly raised the country's ambitions through various amendments to the country's regulatory framework. The number of policies in place to support the RE transition has increased manifold. These policy changes provide a mechanism to ensure that the project is on the right track and meets its objectives. To achieve the objectives of the project, the following policies and programmes aimed at the improvement of the generation as well as the adoption of solar energy in the country have been introduced.²⁷

- The Inter-State Transmission System charges and losses for inter-state sale of solar and wind power for projects to be commissioned by March 2022 have been waived off to encourage setting up of the projects in states that have greater resource potential and availability of suitable land.
- Target for Solar Parks has been enhanced from 20 GW to 40 GW. 41 Solar Parks in 21 States with aggregate capacity of over 26 GW have already been sanctioned.

²⁶ The Economic Times (2015). Article accessible at: <https://economictimes.indiatimes.com/news/politics-and-nation/germany-extends-2-25-billion-support-to-india-for-clean-energy-corridor-solar-projects/articleshow/49236058.cms>

²⁷ <https://pib.gov.in/newsite/PrintRelease.aspx?relid=179768>

- The Indian Government is in the process to notify Renewable Purchase Obligation (RPO) trajectory upto the year 2022, and Renewable Generation Obligation (RGO) has been introduced to encourage coal based thermal power generators to diversify in RE portfolio.

Case Study II: GCF Line of Credit for Solar Rooftop PV deployment in India

Brief Overview of the Project	
Information	Description
Title of Project	Line of Credit for Solar Rooftop segment for Commercial, Industrial and Residential Housing Sector
Action Area	Mitigation
Focus Area	Financing
Objectives of Project	Enabling access to long term, affordable finance for solar rooftop installation projects in commercial, industrial and residential housing sectors, including vulnerable communities
Level of Project	National
Geographic Coverage	India
Sectors targeted	Renewable energy- Solar PV; Commercial, Industrial and Residential Housing
Timeline	
Date of Implementation	01/04/2018
Estimated Implementation Period	5 years
Expected Date of Completion	31/03/2023
Status of project	Completion pending
Investment Data	
Total Project Investment	USD 250 million
Financing	Private loan financing (by GCF); Co-financing (60%- by TCCL and equity of project developer)
Implementing/ Funding Entity	

Brief Overview of the Project	
Information	Description
International Funding Entity	Green Climate Fund
Intervention of Funding Agency	40% co-financing by GCF of USD 100 million, in form of senior loan. Aim of funding is to overcome barriers of low-carbon investment.
National Designated Authority	Ministry of Environment, Forests and Climate Change
Accredited Entity	National Bank for Agriculture and Rural Development (NABARD)
Executing Entity	Tata Cleantech Capital Limited (TCCL)
Beneficiary	Commercial, Industrial & Residential housing sectors

Background

A critical part of India's 175 GW of renewable energy (RE) generation capacity by 2022, is a specific target of 40GW of solar rooftop projects. Till March 2019, 28GW of solar capacity had been installed in India²⁸, of which the share of solar rooftop was seen to be just 14%. Even though the solar rooftop capacity reached, is much below the expected goal, Institute of Energy Economics and Financial Analysis (IEEFA) has observed that rooftop solar has seen the fastest growth rate, among renewable energy sub-sectors in India. Between 2012 and 2018, a compound annual growth rate of 116% has been observed for this sector.²⁹

As of September 2019, the solar rooftop installed capacity had reached 5,252 MW, with 53% of this installed capacity coming from the industrial sector, 21% from the commercial, 12.6% from the public sector and 13.5% from the residential sector. Though capacity addition between 2018 and 2019 has increased by 17%, however, growth rate has seen a drastic fall.³⁰ According to Bloomberg New Energy Finance, one of the major bottleneck in the solar rooftop sector is the lack of growth of this market on the residential front and which can be attributed to the fact that most PV is fully self-funded. Improved access to debt for rooftop developers or customers would accelerate the market.³¹

Many schemes have been introduced to help reach the target India has set. The World bank, with the State Bank of India (SBI) implemented a scheme to support addition of 235MW of solar rooftop

²⁸ All India Installed Capacity. March, 2019. CEA. http://www.cea.nic.in/reports/monthly/installedcapacity/2019/installed_capacity-03.pdf

²⁹ Garg, Vibhuti., Buckley, Tim. May, 2019. Vast Potential of Rooftop Solar in India- Scaling the Pace for Rapidly Increasing Rooftop Solar Installations in India. Institute for Energy Economics and Financial Analysis.

³⁰ India Solar Rooftop Map, September 2019. December, 2019. Bridge to India. <https://bridgetoindia.com/report/india-solar-rooftop-map-december-2019/>

³¹ Accelerating India's Clean Energy Transition- The future of rooftop PV and other distributed energy markets in India. November, 2017. Bloomberg New Energy Finance. https://data.bloomberglp.com/bnef/sites/14/2017/11/BNEF_Accelerating-Indias-Clean-Energy-Transition_Nov-2017.pdf

capacity.³² Concessional loans have been made available for financial assistance of USD 750 million (€688 million)³³, by Asian Development Bank (ADB), New Development Bank (NDB). KfW has also extended financial support for rural solar deployment.³⁴ Commercial Indian banks like SBI, Punjab National Bank (PNB), and Canara Bank, have also assisted for solar rooftop projects.³⁵

The government has enacted and promoted a number of macroeconomic level sector reforms to help assist a transition to renewable energy, and specially solar power. Financial intervention is still however required to overcome hurdles and barriers.

NATIONAL POLICY FRAMEWORK^{36 37 38}

In India, there are many policies and schemes for driving renewable energy (RE), especially from solar. These were used as the basis for India's proposal to GCF, through its National Implementing Entity –NABARD, asking for support to help achieve the country's RE goals.

- Energy policies like **Electricity Act 2003**, **National Electricity Policy 2005**, and **Integrated Energy Policy 2006** promote the shift to and development of RE. These coupled with specific **Infrastructure Policies**, directly help drive solar rooftop PV's adoption. These policies/ schemes help this transition by incentivising people to shift to a cleaner form of energy consumption. Schemes like *The Energy Conservation Building Code (ECO Niwas Samhita)*, specifically the Residential Buildings (ECBC-R), aims at boosting energy efficiency in the residential sector and create more demand for renewable energy-generation sources. Specifically for solar rooftop installation, schemes/policies like *Model Building Bye-Laws 2016*, mandate rooftop PV installations for both old and new buildings, *Net Metering* encourages self-consumption of electricity generated from the solar rooftop and *Rent a Roof Policy* promotes developers to rent out rooftops and offer leases to each household, and feed the power to the grid.
- **Fiscal Initiatives:** Financial support, through fiscal and monetary policies, have also helped boost this shift to solar power, specifically for solar rooftop PV.
 - a. MNRE announced *financial incentives for DISCOMs* to support rooftop solar installations, through direct and indirect tax benefits such as sales tax, excise duty exemptions and custom duty exceptions.
 - b. *Exemption from income tax*, for project developers, on all earnings from a project in its first 10 years of operation and *accelerated depreciation (AD)* for solar energy producers to claim 40% of the costs in the first year itself.
 - c. *Solar Rooftop Subsidy Scheme*, provides capital subsidies to promote use of solar rooftop by providing subsidy on solar rooftop installations to the residential sector consumers.
 - d. *Tariff Policy, 2006* has started the mechanism of *Renewable Energy Portfolio (RPO)* to fix a minimum percentage of purchase of energy consumption from renewable energy sources, by the States, and giving special tariff to solar energy. Further, *Renewable Energy*

³² The World Bank. India Project Update: Grid Connected Rooftop Solar Photovoltaic Program. February, 2019. <https://www.worldbank.org/en/results/2019/02/27/grid-connected-rooftop-solar-photovoltaic-project>

³³ Conversion on basis of current conversion rate. 1 USD = 0.916 EUR; used throughout the document

³⁴ Clean Technica. August, 2018. KfW Signs €200 Million Loan To Promote Renewable Energy In Rural India. <https://cleantechnica.com/2018/08/23/kfw-signs-e200-million-loan-to-promote-renewable-energy-in-rural-india/>

³⁵ PIB, MNRE. December 2017. <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1514215>

³⁶ Energy 2020, India. Global Legal Insights. <https://www.globallegalinsights.com/practice-areas/energy-laws-and-regulations/india>

³⁷ Goel, Malti. July, 2016. Solar rooftop in India: Policies, challenges and outlook. Green Energy and Environment, Vol. 1, Issue 2, pp. 129-137. <https://www.sciencedirect.com/science/article/pii/S2468025716300231>

³⁸ GCF Documentation. Funding Proposal- FP081: Line of credit for solar rooftop segment for commercial, industrial and residential housing sectors. National Bank for Agriculture and Rural Development (NABARD). March, 2018.

Certificates were introduced as a market based mechanism, in 2011 to enhance renewable energy capacity.

- Special focus has been placed on solar power through **Jawaharlal Nehru National Solar Mission (JNNSM), 2010** and **Generation based Incentives (GBI) for Solar**. JNNSM gave specific targets of 20,000 MW of grid-connected and off-grid solar power capacity by 2022 with 2000 MW as share of off-grid capacity. Introduced in 2009 for small grid solar projects below 33 kV, GBIs are provided for bridging the gap between the base tariff and the tariff determined by the Central Electricity Regulatory Commission (CERC), as a fiscal incentive.

KEY BARRIERS^{39, 40}

Even though many government policies, fiscal incentives and financial support from banks and organisations exist in the solar rooftop sector, many barriers still exist that do not allow a smooth penetration by developers into this sector.

- The major problem project developers face, in terms of financial blockage, is the limited availability of low cost project financing, low term debt financing, and lack of availability of low cost financing.
- Financiers, however, are not able to overcome this barrier because investing in solar rooftop development also comes with a set of challenges, mainly due to high-risk perception within the sector, limited information on the track records of rooftop solar investments and small size and high cost of financing.
- From a financing entities perspective, the lack of availability of collaterals, customer risk in terms of payment insecurity and credit rating, challenge in rooftop rights of individual also discourage investment into this sector.
- Weak enforceability of contracts under the existing regulations, lack of clear and dependable policies, have been seen to come up as regulation barriers. Additionally even with the existence of financial or regulatory support, subsidy delays, tariff risk, gaps in net metering policies, do not allow easy penetration.
- Developers and further DISCOMs face the hurdle of lack of availability of feasible roofs for project installation because of lack of customers, lack of capacity building on rooftop systems, fear of loss of customer revenue.
- Finally, the biggest roadblock in deploying solar rooftops from the DISCOMs and even project developers, is their limited technical expertise on grid integration of small-scale rooftop systems

International Climate Finance from GCF for India's Solar Rooftop Drive

To help reach India reach its goal of 40GW solar rooftop capacity by 2022, Green Climate Fund (GCF) has provided concessional loan assistance of USD 100 million (~€92 million) in the form of Senior Loans in 2018. The aim of this financial assistance is to accelerate private sector initiatives for the creation of rooftop solar photovoltaic (PV) power capacity across India.

Lack of financial capacity is one of the major reasons for the slow growth of solar rooftops in India, which this loan aims to address. The GCF support is required at this stage given the challenges associated to long-term financing options to the solar rooftop segment. The concessionality offered by

³⁹ Gupta, S., Sharda, J., Shrimali, G. September, 2016. The Drivers and Challenges of Third Party Financing for Rooftop Solar Power in India. Climate Policy Initiative. <https://climatepolicyinitiative.org/wp-content/uploads/2016/09/The-Drivers-and-Challenges-of-Third-Party-Financing-for-Rooftop-Solar-Power-in-India.pdf>

⁴⁰ PWC. Clean Technology Fund and Rooftop Solar in India. August, 2018. https://www.eqmagpro.com/wp-content/uploads/2018/08/Clean-Technology-Fund-and-Rooftop-Solar-PV_Final-.pdf

GCF will be competitive with other financial lending institutions because it is helping overcome the major financial barriers that exist in this sector.

The implementation of the given project, under GCF monitoring, is to be taken care by National Bank for Agriculture and Rural Development (NABARD), in its role as the National Implementing Entity and in its capacity as Direct Access Accredited Entity of GCF. Further, NABARD also signed a subsidiary agreement with Tata Cleantech Capital Ltd. (TCCL), to support this development of Solar Rooftop units for commercial, industrial and housing sector.⁴¹ Additionally, TCCL will also contribute USD 100 million into the programme. TCCL has been developed with the mastery in providing end to end business solutions, in terms of financial and technical advisory, in the renewable and clean technology sphere. Through its existing industry knowledge & unmatched expertise, TCCL has already helped fund over 3 GW renewable energy projects. This expertise will act as a pull for other developers to reach out for this programme.

The aim is to unlock more than 250 MW solar energy through private sector engagement through the use of solar panels across the rooftops in India. This initiative has been developed as a blended financing instrument, of about \$250 million, or approximately €229 million (\$100 million of GCF loan facility, \$100 million by TCCL funds and the remaining being the equity share by developers). GCF's line of credit is the key catalyst of finance for the programme, aimed at mobilizing private and commercial financing from domestic sources. Additionally, TCCL and GCF's advantage in the technical sphere enables participation of other rooftop solar developers, and help replicate a programme in either the solar rooftop sphere or any other renewable energy project.

OBJECTIVE

With the assistance of the GCF, TCCL will receive the necessary assistance to develop a fit-for-purpose framework⁴² to allow the ambitious scale-up of solar rooftop capacity in India. By providing financial assistance in this respect, the programme is expected to lead to creation of a viable economic model in the solar rooftop space and will attract competitive financing in the currently unbanked sector. The main objectives of the programme are to:

1. Facilitate long-term and affordable financing for the construction of 250 MW of rooftop solar capacity in India, which is expected to reduce emissions by 5.2 million tonnes of CO2 equivalent over 20 years.
2. Provide financial assistance to private developers in the solar market. It has been developed as a private sector-driven initiative to increase and enable private sector investment through enabling bankable solar projects. Helping solar rooftop awardee projects secure long-term debt financing, to allow them to timely reach financial close and advance to construction and operation, and thus, assisting these project developers overcome the financial barriers and challenges that exist in the installation of solar rooftop.
3. Bridge existing gaps/current barriers in the rooftop solar sector. TCCL, through its expertise, aims to cater to the specific market needs and be a facilitator to bridge this gap.

⁴¹ NABARD. NABARD signs MoU with Tata Cleantech Capital Limited. February, 2019. <https://www.nabard.org/events-past-article.aspx?id=25&cid=550&EID=78>

⁴² Fit-for-purpose framework in terms of loans provided to expand the solar rooftop capacity in India. This includes a framework designed to standardise the deployment of funds to the projects developers. Deployment of loans provided will be carried out by TCCL, according to a certified disbursement schedule. Further, the concessionality obtained by TCCL (extended by GCF), shall be passed on to the project developers with interest charges on project basis.

4. Compete with existing lending institutions by providing blended financial resources through concessional lending by GCF, aided by the support of TCCL, making the green finance products more competitive.

BARRIERS ADDRESSED

The GCF Solar Rooftop Programme is designed in a way to address the key financial barriers mentioned above, and providing several advantages to the growing solar rooftop segment in India:

- It will help **fill the financing gap** that exists in the current scenario. It aims to overcome the lack of financial aid provided because of high cost of capital, by attracting private sector interest. Commercial financing has its own limitations in volume and tenor terms, which is also expected to be overcome with this project. The project will hence act as a validation for investors and lenders, and **reduce the risk perception** associated with the sector. In addition, the programme will help introduce a specially designed financial product for these types of investments going forward.
- The issue of **access to long-term, low-cost debt can be improved**, especially the issue that many developers face at the infrastructural development level due to the high perceived risks and limited information on the track records of rooftop solar investments, which is a key barrier for commercial lenders. Even when banks lend to rooftop solar projects, the high-risk perception and high per unit transaction cost has led to high costs of borrowing, thereby negatively impacting internal rate of return of the project, which is aimed to be addressed through this project.
- The proposed programme will finance an initial set of projects supporting short term objectives with longer term impacts, i.e. to **allow the financial close, construction and operation** of these projects to demonstrate their technical and financial viability. This will allow it to pave way for sustainable market development, by allowing market players to see its financial viability, and helping pave way for future participants.

KEY ACTORS AND FINANCIAL MODEL

The programme has been developed as concessional loan being passed on from GCF for deployment in India through NABARD and TCCL, as a blended finance instrument for solar rooftop project developers in the commercial, industrial and residential sectors in the country.

Key Actors

- **Green Climate Fund (GCF)** has helped finance three projects in India till now, with a total financing of USD 177.8 million (~ €163 million), within both the mitigation and adaptation spheres.⁴³ This includes the project on Solar Rooftop which aims to help India reach its goal of 40GW of solar rooftop energy by 2022.
- **National Bank for Agriculture and Rural Development (NABARD)** is a development financial institution in India. It was accredited as the National Implementing Entity and a direct access accredited entity for GCF, to help implement climate change related projects in India.

For this specific project, the overall programme level impact is overseen by NABARD for GCF, and NABARD is also responsible for ensuring programme level compliance, as per the Accreditation Master Agreement (AMA)/Funded Activity Agreement (FAA), and any further co-ordination with

⁴³ Green Climate Fund. <https://www.greenclimate.fund/>

GCF. GCF funds for the programme are given to NABARD in USD, and NABARD is then responsible for converting the funds to INR and hedging against currency fluctuations,⁴⁴ before further passing the funds to TCCL for deployment, along with a part of the hedging cost.

- **Tata Cleantech Capital Limited (TCCL)** is as a private sector for-profit green financing enterprise. In 2013 it was started as a joint venture, owned 79.5% by the Tata Group, and 19.5% by the International Finance Corporation (IFC), with about \$130 million (~ €119 million) of equity capital and retained profits, which is further leveraged by market borrowings. The aim of this “non-banking financing company”, is to create and mainstream new financing markets in green sectors in India. Borrowing from Indian banks, borrowing from capital markets by issuing non-convertible debentures and bonds, or borrowing from international climate investors, like the case of GCF funding, is another way that they fund to invest in climate projects. On the asset side, TCCL invests by providing senior debt to the project, just like in the case of this project.⁴⁵

In terms of governance, individual project and cumulative programme level impact shall be done by TCCL, under NABARD acting as the overall head. further, the main role of TCCL is at the implementation side, where determining whether the proposals meet the programme funding requirements, and analysing the credit risk of each individual project will be done by TCCL. Monitoring the compliance at the project level, and cumulation of small projects to programme level will also be carried out by TCCL. The concessionality extended by GCF and received by TCCL, will be further passed to the project developers,

- The main aim of this programme is to help **solar rooftop project developers** access financial aid, to help increase the solar rooftop capacity in India. The project developers are financed directly by TCCL, through loans. Eligibility of each developer is determined by TCCL, using established rules and criteria for businesses, operational and credit risk evaluation. On this basis they get specific rates of loan and the tenor period.

The project developers being targeted through this programme are from the Commercial, Industrial and Residential Sectors. Of the total GCF loan, 70% of the funds are allowed for project developers using Capital Expenditure (CAPEX) model, and 30% for those using Operational Expenditure (OPEX) model. Project developers aiming at developing solar rooftop in vulnerable communities are specifically encouraged.

Financial Model

Following an equitable approach, the programme aims to provide financial assistance, through loans, to commercial, industrial and residential housing sectors, to partially cover the upfront cost of investing in solar roof top PV systems. Through this equitable approach, for each of the sectors:

1. The GCF resources will cover an average of up to 40% of the upfront system and installation costs (USD 100 million)
2. TCCL shall add to this by 40% out of its resources (USD 100 million or ~ €92 million)
3. The balance 20% will pitched in by the project developer as equity (USD 50 million or ~ €46 million)

The type of facility that the loan shall be available to the project developers from TCCL shall be in form of :

- Master Line of Credit, where the loan shall be sanctioned to execute multiple solar rooftop projects

⁴⁴ The amount received in USD is converted to INR at spot rate. Hedging is done for shorter periods and in a rolling hedge form – which implies a short-term hedge for about 4-5 years, renewed cyclically before the expiration of the previous hedge.

⁴⁵ NRDC. Green Bank Network. Tata Cleantech Capital Limited: Driving Green Investment in India. December, 2019. <https://www.nrdc.org/sites/default/files/tata-cleantech-capital-spotlight-fs.pdf>

- Project Mode, where the loan shall be availed for only one project.

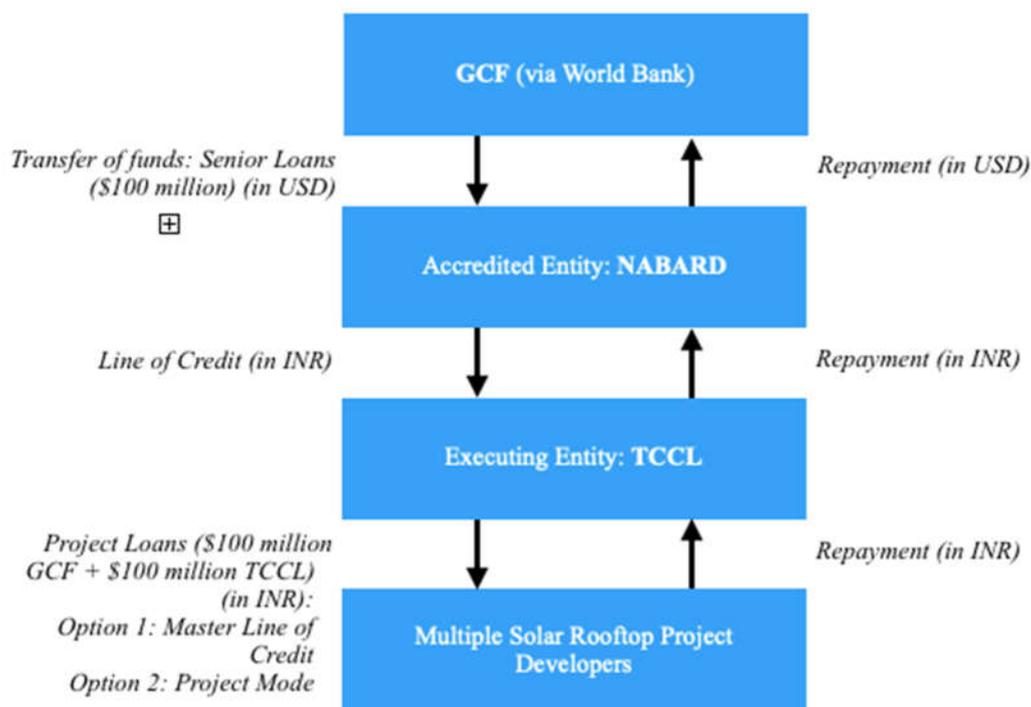


Fig. #: Financial Flows among Key Actors

The Repayment Mechanism, for loans granted by TCCL to project developers, shall be on either of the two following basis:

- Grid-connected system- in this case, a long term PPA (power purchase agreement) is entered into by the borrower with the state utility, which is assigned in favour of TCCL till the tenure of the funding. The ownership of assets and liability of the operations and maintenance is on the borrower.
- Projects where the entire capacity is being utilised by the borrower for its captive use- TCCL shall estimate a probable amount of electricity cost saving, and the repayment shall be from a part of the savings realised.

A key focus of this programme is towards supporting the more marginalized sections, such as the MSMEs, households not connected to national grid/with poor grid availability (providing last mile connectivity), states with low gender ratio and so on, which will be provided at least around USD 100 million of the total programme funds.

Of the total GCF and TCCL loans (USD 200 million), around \$130 million will be aimed towards the commercial and industrial sector, USD 50 million will be channelised towards institutional and social sector, especially since an already increase in demand from these sectors for installation of solar rooftop systems is expected. Around USD 20 million is envisaged to be aimed at the residential segment as well. Eligibility of each of customers will be determined by TCCL using established rules and criteria for business, operational and credit risk evaluation.

POLICY LINKAGE

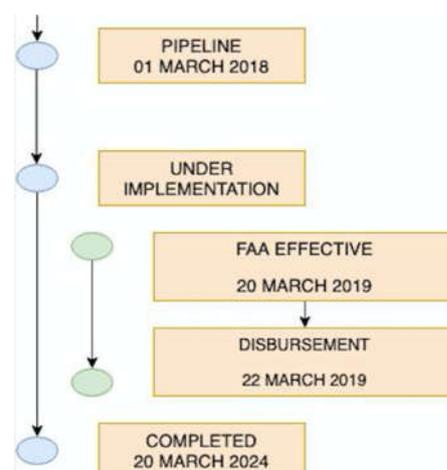
The policies that already exist in the solar sector in the country face the problem of enforceability. Fiscal policy support, in the form of tax or subsidies, all work in the favour of solar rooftop development and aim to promote the use of the same. RBI has even identified the sector as a priority lending sector to overcome the barrier of low investment. However, one of the major reason that rooftop solar penetration is less in the country is because of the barrier of financial aid not being provided for the project developers. There also exist policies that affect the lending rate. Therefore, it is necessary to understand the local conditions that drive the financing and understand the commercial consequences of the policies, which may affect the rate of lending.

GCF, acts as a neutral facilitator, and will hence pave the way to bring further reforms. This also gives it the ability to convene all the stakeholders involved including development partners towards attainment of common goals. With this programme the barrier of financial aid is being overcome to an extent, to allow project developers to take full advantage of the already existing policies, and aid more policies to be developed.

CURRENT STATUS

The project is under implementation. It was approved on 1st March, 2018, at the 19th meeting of the GCF Board and is slated for a completion by 20 March, 2024.

The first disbursement of USD 50 million was commenced in April 2019, to NABARD, the Accredited Entity, through which the converted funds were lent to TCCL. The programme aims to support the decarbonisation of the economy and meet Paris commitments by shifting to non-fossil fuel sources of energy, solar energy playing a significant role in this. The project implementation by TCCL started in September 2019. Currently, TCCL has a pipeline of rooftop solar proposals for funding which are at various stages of assessment. TCCL shall consider all such pipeline deals for funding under this programme. The disbursement of funds from GCF to TCCL (through NABARD) will be carried out in annual tranches in line with the capacity proposed to be deployed every year over the programme implementation period.



Source: GCF project report

TRANSFORMATIONAL CHANGE ASSESSMENT

Hypothesis 1: International climate funding helps mainstream project financing in green sector of a country, and making finance terms for green projects more competitive.

India has the set goal of reaching 100GW of solar energy by 2022, of which 40GW is set for power generation from solar rooftop. According to a report by Mercom India, at the end of 2019, the solar rooftop capacity had reached only about 4.4 GW.⁴⁶

⁴⁶ India's rooftop solar capacity reached 4.4GW in 2019: Report. February, 2020. ET Energy World. The Economic Times. <https://energy.economictimes.indiatimes.com/news/renewable/indias-rooftop-solar-capacity-reached-4-4-gw-in-2019-report/74208295>

An estimated USD 34 billion (~ €31 billion) is required to help reach the 40GW target for rooftop solar by 2022, as per a 2016 analysis.^{47 48}

Attracting private sector interest in technical emerging sectors can be difficult, especially if they are not supported by availability of suitable finance. A significant barrier in the solar sector of the country was the lack of investment and funding of small-scale individual projects, as was the case with solar rooftops. This is mainly due to the lack of long term debt structures and financing for small projects from relatively unknown developers, having high perceived risks from a commercial lending perspective. Hence, two major financial issues that exist in this sector are:

1. Lack of long term debt financing
2. Lack of private sector participation because of high risk perception

Availability of long term debt financing (i.e. tenors of at least 12-15 years) has always been seen as a limitation, especially because of the tenor periods of the loans offered (i.e. tenors of at least 7-8 years) do not meet the necessities of development in this sector. The investment needs, associated with this sector cannot be met with the existing financial products, in terms of tenor period. The institutions that offer these types of tenor aids are also limited. The financial help needed, hence, exceeds the available financial aid available from multilateral, bilateral and national sources (i.e. loans offered by World bank, KfW, SBI, and other commercial banks in India). Therefore, funding through international climate finance has enabled the project developers to access loans at a competitive rate, in terms of tenor period, compared to other lending institutions, which may help make the cost of debt to come down further. The terms of the loan offered, in terms of interest rate and tenor period, will be assessed individually on project to project bases, however, this financial aid is targeting to overcome the lack of long term debt financing, by extending the tenors to at least 12-15 years.

The other barrier being addressed by this programme, is helping attract private sector interest. An assessment of how GCF lending has helped in reducing the risk perception associated with the solar rooftop sector, can help analyse how accessibility to funds has increased. The financial aid is helping reach out specifically to those segments that do not have direct or easy access to financing in the sector. Lending to project developers with mixed portfolios (wind and solar) has also increased. TCCL is assisting in changing the general landscape of the sector. There has been an increase in the number of project developers who approach TCCL.

Through international climate financing, as was the case in this GCF project, a domestic finance institute was able to overcome these challenges. This specific project for solar rooftop PVs, enables project financing in the green sector to be mainstreamed. The design of the financial products offered under the programme, aims to fund upto 80% of the upfront investment cost, ensuring that smaller developers are able to take up such investments and the projects remain commercially viable in terms of scale. TCCL has helped develop this project with a Faster Turnaround Time (TAT). As per market feedback, TCCL has an advantage over other conventional lenders because of its fast turnaround in processes like structuring, sanctioning, disbursement etc. of loans. This further acts as an advantage in terms of the financial effect of the increased leverage. The concessional pricing being offered by GCF, blended with the TCCL financial product, offered in terms financial close, construction and operation of projects, will allow the demonstration of the financial and technical viability of solar rooftop development.

While, commercial banks are also lending to the segment, their drawback is that the sector is not their focal area, hence they do not have the expertise in properly assessing and supporting these projects.

⁴⁷ GCF Documentation. Funding Proposal- FP081: Line of credit for solar rooftop segment for commercial, industrial and residential housing sectors. National Bank for Agriculture and Rural Development (NABARD). March, 2018.

⁴⁸ The India Lab- Rooftop Solar Private Sector Financing Facility: Instrument Design and Analysis. October, 2016. Shakti Sustainable Energy Foundation, David and Lucile Packard Foundation, Climate Policy Initiative and UK Government.

TCCL, with support from GCF funding, has the competitive advantage, which is further enhanced by its domain knowledge expertise in the sector.

This project is expected to overcome these market barriers through demonstration of financing viability of this sector. The project will hence act as a validation for investors and lenders, and reduce the risk perception associated with the sector. This “learning by doing” approach will have significant implication in increasing investment in this sector, encouraging small scale deployments and positively affecting the regulatory framework.

Hypothesis 2: Provision of international climate finance plays an important role in bringing together a range of key actors who can raise ambition of developing countries.

India has seen a capacity addition of solar rooftop over the years, 17% higher alone between the year 2018-19, but the growth rate has however seen a sharp downfall.⁴⁹ To encourage private investment in this sector, many financial aid schemes have been in place over the past years. These schemes have been introduced to help reach the target India has set. Over the year, many schemes and loans have been extended by International players in this sector.⁵⁰

Lender	Borrower	Timeline/ Line of Credit
KfW	IREDA	2015; USD 340 million (~ €311 million)
World Bank and CTF	SBI	2016; USD 625 million (~ €573 million)
ADB and CTF	PNB	2017; USD 500 million (~ €458 million)
GCF	TCCL	2018; USD 100 million (~ €92 million)

The KfW loan, through IREDA, was on financing loans at tenor term of 9 years, with 1 year moratorium. The loan available to SBI was on Programme for results (PforR) basis, to help increase solar rooftop capacity in India. The loan accessed by PNB looked at only industrial and commercial sector, and the loan extended by GCF looks at three major sector, industrial, commercial and residential sector, with residential sector having the slowest outreach in the solar rooftop market.

Even though financial assistance for this sector is available through other sources, this loan will be beneficial because of 1. The sectors being targeted, 2. The involvement of TCCL, which has advantage over other players because of its expertise in this field.

The loan being provided through this programme are being given to industrial, commercial and residential project developers. Of these, loans mostly given out to C&I sector developers, larger companies, more mature businesses, and developers.

The programme is being developed to reach out to a range of developers – from established players to new MSME scale developers.

⁴⁹ India Solar Rooftop Map, September 2019. Bridge to India. <https://bridgetoindia.com/report/india-solar-rooftop-map-december-2019/>

⁵⁰ Rooftop Solar in India: Looking back, Looking ahead. PwC and Climate Investment Funds. https://www.climateinvestmentfunds.org/sites/cif_enc/files/rooftop_solar_pv_in_india_ctf_pwc._v8pdf_0.pdf

Looking at the sectors, TCCL's lending criteria involves evaluating borrowers in terms of credit rating, price, charges, PPA, capacity (on basis of consumption), and analyzing their portfolios (based on the monitoring and evaluation criteria set by GCF). Lending to MSME and Residential sector is difficult due to scale, cost of acquiring finance and assessment of credit worthiness. The problem of bankability for residential, and MSME developers exists, which this programme aims to overcome with eventual proceeding of the programme. They want to help develop a workable bankable model to help increase lending to residential sector project developers.

The aim is to provide at least ~USD 100 million of the total loan funds (USD 200 million or ~ €183 million, of GCF and TCCL combined) towards the most vulnerable communities through MSMEs, and households not connected to national grid or with poor grid availability.

Further, from a social perspective, this programme also aims to target communities and states that have solar rooftop growth potential, as well as lower than average gender ratio. This will allow an equitable growth in social terms of the solar rooftop sector. States like Delhi, Gujarat, Maharashtra, Rajasthan, Punjab, etc. are being targeted from the gender perspective side. Similarly, states like Andhra Pradesh, Karnataka, Telangana, and Tamil Nadu are being targeted, from the perspective of having high growth potential in the solar rooftop sector.

Rooftop capacity expansion in India follows the Capital Expenditure (CAPEX) model, with over 80% developers using this. The substitute of this is OPEX (Operational Expenditure) model, which has been seeing growing interest over the past years, seeing an increase from 3% in 2012 to 23% in 2016.⁵¹ According to a 2019 report on India's solar rooftop map, 1558 MW was through OPEX model in comparison to 3694 MW through CAPEX model.⁵²

Players looking at increasing solar rooftop capacity using OPEX model, have faced the issue of bankability, and fiscal constraints in deployment of capital, in the case of government projects. This project, is hence going to help by reaching out to developers in the OPEX space as well. This is being done by giving 30% of total funds to OPEX model project developers. This is done to help increase the financial feasibility of projects developed under this model. CAPEX models on the other hand are to be utilised under the CAPEX model.

The programme funding will act as a validation for other lenders as well as other investors that fund such projects. The specific programme will allow these projects to be set up giving sponsors, service companies, lenders the required guarantee about the feasibility and viability of the projects, and help encourage future investments and developers. Also by focusing on certain states it will allow an equitable growth of the sector, allowing participation to be more varied.

Hypothesis 3: International climate finance has more visibility to allow direct impact and push for change. The funding has aided in making a fast growing sector replicate at a faster pace.

Expansion of solar rooftop capacity has seen an increase over the past few years. Between 2012 and 2018, a compound annual growth rate of 116% has been observed for this sector. Rooftop installations grew 66% (year-over-year) with capacity additions of 1,655 MW in 2018.⁵³ However, Mercom report for 2019 found a year-on-year decline of 33%.⁵⁴

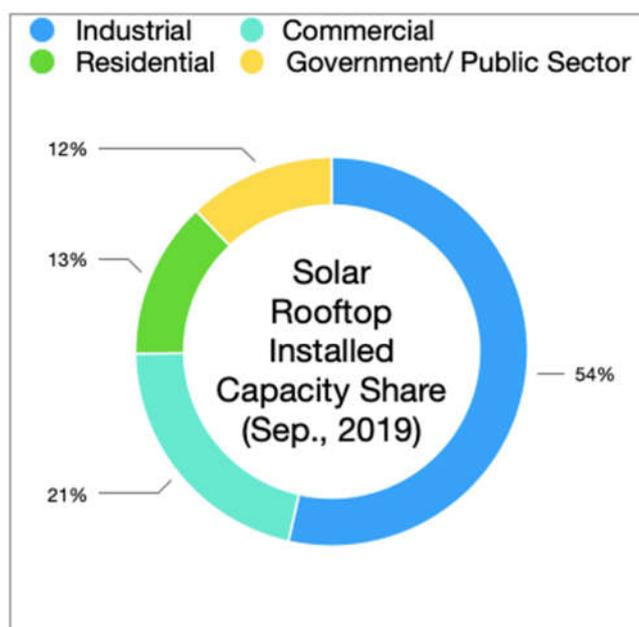
⁵¹ GCF Documentation. Funding Proposal- FP081: Line of credit for solar rooftop segment for commercial, industrial and residential housing sectors. National Bank for Agriculture and Rural Development (NABARD). March, 2018.

⁵² Bridge to India – India Solar Rooftop Map (September 2019)

⁵³ Garg, Vibhuti., Buckley, Tim. May, 2019. Vast Potential of Rooftop Solar in India- Scaling the Pace for Rapidly Increasing Rooftop Solar Installations in India. Institute for Energy Economics and Financial Analysis.

⁵⁴ India's rooftop solar capacity reached 4.4GW in 2019: Report. February, 2020. ET Energy World. The Economic Times. <https://energy.economictimes.indiatimes.com/news/renewable/indias-rooftop-solar-capacity-reached-4-4-gw-in-2019-report/74208295>

The introduction of a solar rooftop programme through a high profile international funder like GCF is likely to further bring reforms, as well as increase the growth of this sector. Various regulatory bodies and stakeholders in India recognise that GCF is neutral and this gives it the ability to facilitate many initiatives and reforms in the country that other development partners cannot. This also gives project developers of the sector an umbrella under which to convene all the key stakeholders involved to identify the main barriers and deliberate on strategies for growing the sector. This can be understood how GCF and TCCL are assisting in changing the general landscape of the sector.



Source: Bridge to India. India Solar Rooftop Map, September 2019.

As per September 2019, C&I sector was leading in solar rooftop capacity. The expansion over the years has also been seen mostly in these sectors.

This programme, was hence aiming to target the residential sector as well, to allow an overall growth in the solar rooftop capacity in India. The GCF programme will act as a financial push to change the overall landscape of solar rooftop in the country. Further, it will also act as an enabler to allow change in the regulatory side.

Government action through regulation, policies and financial assistance can also act as a push to increase the solar capacity expansion in the country. There already exists financial assistance from the government side in different sectors in the country for solar rooftop installation. These financial incentives will be further complemented by GCF loan assistance. Specifically, looking at the sector beneficiaries in terms of financial assistance we find the following.

Agents of Change- Government		
Sector-wise Eligibility of Central Financial Assistance/ Incentive		
Category	Central Financial Assistance (CFA) / Achievement linked Incentive & awards	GCF Loan Assistance Aim (Aimed out of USD 200 million or ~ €183 million of GCF & TCCL)
Residential	CFA upto 30% of benchmark cost for General Category States/UTs and upto 70% of benchmark cost for Special Category States/ UTs	USD 20 million (~ €18 million)
Institutional		USD 50 million (~ €46 million) (Aimed out of USD 200 million or ~ €183 million of GCF & TCCL)
Social Sector		
Private, Commercial and Industrial Sector	No CFA/ No Incentives	\$ 130 m (~ €119 million)

Source: <https://solarrooftop.gov.in/pdf/faq.pdf>

The fact that specific goals have been set, especially when it comes to helping the residential sector acts as a validation for other investors to also increase their investment in this sector.

International climate finance also helps cover the structural gap that may be present in a given sector, through the competitive financial aid that is being provided. The structural gap being overcome in the solar rooftop sector in India, exists in the residential sector. According to Bloomberg New Energy Finance, one of the major bottleneck in the solar rooftop sector is the lack of growth of this market on the residential front and which can be attributed to the fact that most rooftop PV projects are self-funded. Improved access to debt for rooftop developers or customers could accelerate this segment.⁵⁵ The GCF programme aims to direct ~\$20 million (~ **€18 million**) to the residential sector through concessional loans, aiming to act as a catalyst for the segment by demonstrating the financial viability of residential solar rooftop projects.

⁵⁵ Accelerating India's Clean Energy Transition- The future of rooftop PV and other distributed energy markets in India. November, 2017. Bloomberg New Energy Finance. https://data.bloomberglp.com/bnef/sites/14/2017/11/BNEF_Accelerating-Indias-Clean-Energy-Transition_Nov-2017.pdf