GGGI TECHNICAL REPORT NO. 20

# Closing the Climate Financing Gap:

## Stocktaking of GGGI Green Investment Projects 2015-2020

September 2021

GGGI

## PART OF GGGI'S TECHNICAL REPORT SERIES

1. Market Assessment of Fuel Pellets and Green Charcoal for Energy Uses in Senegal, Dereje Senshaw, 2017.
2. Policy Recommendations on Energy for Productive Uses in Rural Areas of Senegal, Dereje Senshaw, 2017.
3. GGPA Synthesis Report, Jan Stelter, 2018.
4. Meeting Global Housing Needs with Low-Carbon Materials, Christina Cheong and Donovan Storey, 2019.
5. Green Growth Index Concept, Methodology and Applications, Lilibeth Acosta, et al., 2019.
6. GGPA Methodology Report, Jan Stelter, 2019.
7. G20 Background Paper: Green Growth to Achieve the Paris Agreement, Frank Rijsberman, Orestes Anastasia, Pranab Baruah, Stelios Grafakos, James Kang, and Dereje Senshaw, 2019.
8. Assessment of Feedback from Regional Expert Consultations on The Green Growth Index (Phase 2), Lilibeth Acosta, et al., 2019.
9. Review of GGGI's Experience to Design and Operationalize National Financing Vehicles to Finance Climate and Green Growth Policy Implementation, Fenella Aouane and Frank Rijsberman, 2019.
10. Assessment of Complementarities between GGGI's Green Growth Index and UNEP's Green Economy Progress Index, Lilibeth Acosta, et al., 2019.
11. Green Growth in Action: Achieving Green Energy Transformation, Dereje Senshaw, Muharrem Askin, Bolormaa Chimednamjil, 2020.
12. Employment Assessment of Renewable Energy: Power Sector Pathways Compatible with NDCs and National Energy Plans, Stelios Grafakos, Dereje Senshaw, Diana Alejandra Quezada Avila, 2020.
13. Achieving Green Growth and Climate Action Post-COVID-19, Frank Rijsberman, Lilibeth Acosta, Nishant Bhardwaj, Chris Dickinson, Mark Gibson, Stelios Grafakos, Ingvild Solvang, Donovan Storey, 2020.
14. Green Growth in Action: Attaining Green Cities, Donovan Storey, Aarsi Sagar, et al., 2020.
15. The Promise of Green Growth: A Pathway to Prosperity while Achieving National and Global Ambitions, Orestes Anastasia, Stelios Grafakos, et al., 2020.
16. Green Growth Index 2020 – Measuring performance in achieving SDG targets, Lilibeth Acosta, et al., 2020.
17. Green Growth Simulation Tool Phase 1 – Concept, Methods and Applications, Lilibeth Acosta, et al., 2020.
18. Post-COVID-19 Green Recovery Report Summary: Recommendations to Green Mexico's Recovery at the Subnational Level, Jose L. Amaya, Pablo Martinez, Diana A. Quezada, and Laura Valdez, GGGI Mexico, 2021.
19. Green Recovery and Climate Action: Assessing Green Jobs from Renewable Energy and Forestry Investments for Developing and Emerging Economies, Stelios Grafakos, Hanna Kim, Svenja Krispien, Diana Quezada, Frank Rijsberman, 2021.
20. Closing the Climate Financing Gap: Stocktaking of GGGI Green Investment Projects 2015–20, Lasse Ringius, DaYeon Choi, 2021.



Global Green Growth Institute
Jeongdong Building 19F, 21-15 Jeongdong-gil, Jung-gu, Seoul 04518, Republic of Korea


## ACKNOWLEDGEMENTS

**Authors: Lasse Ringius and DaYeon Choi**

**Special contributions to GGGI project data compilation: Carmen De Pool and YoungWoo Ryoo**

**Review and contributions: Christophe Assicot, Sabin Basnyat, Batzaya Bayasgalan, Romain Brillie, David Fernandez, Rowan Fraser, Timothy Carter Jessup, Juhern Kim, Søren Lütken, Norbert Maass, Anouj Mehta, David Morgado, Ajay Narayanan, Okechukwu Daniel Ogbonnaya, Tero Tapio Raassina, Frank Rijsberman, Ferruccio Santetti, Marcel Silvius, Tran Ngoc Thinh, and Gulshan Vashistha***

*** Affiliation of all authors, contributors and reviewers is GGGI, except for the following reviewers: Sabin Basnyat (GCF, Republic of Korea), Søren Lütken (UNEP DTU, Denmark), Anouj Mehta (ADB, Philippines), David Morgado (AIIB, China), and Ajay Narayanan (Daologic, US)**

# TABLE OF CONTENTS

List of Figures, Tables, Pictures, and Boxes ····· 4

Abbreviations and Acronyms ····· 6

EXECUTIVE SUMMARY ····· 8

1. Introduction ····· 10
2. Closing the Climate Financing Gap ····· 11
3. A Growing Global Portfolio of Green Investment Projects ····· 17
4. Thematic Overview of Green Investment Projects ····· 22
5. Financial Instruments for GGGI's Green Investment Projects ····· 37
6. Investors and Sponsors of Green Investment Projects ····· 41
7. Green Investment Projects Under Implementation ····· 43
8. Looking Ahead ····· 47
9. Conclusions and Recommendations ····· 52

Methodology and Data ····· 55

Annex 1. List of Green Investment Projects, 2015–2020 ····· 56

Annex 2: GGGI Green Investment Portfolio, 2015–2020 ····· 58

References ····· 71

# LIST OF FIGURES, TABLES, PICTURES, AND BOXES

## LIST OF FIGURES


Figure 1. GGGI's value chain ..... 11
Figure 2. Risk-return for climate projects ..... 13
Figure 3. Overview of the ecosystem for green investment services ..... 16
Figure 4. Annual and cumulative investment commitments, 2015–2020 (million USD) ..... 17
Figure 5. Portfolio in terms of sectors, cumulatively, 2015–2020 (million USD) ..... 18
Figure 6. Proportion of mobilized commitments across key sectors/themes ..... 19
Figure 7. Proportion of projects across sectors/themes ..... 19
Figure 8. Proportion of projects across regions ..... 20
Figure 9. Proportion of commitments across regions ..... 20
Figure 10. Regional portfolios of projects (million USD) ..... 21
Figure 11. Financial structure of the project ..... 27
Figure 12. MGFC operational structure ..... 30
Figure 13. Public and private sector cumulative investment commitments, 2015–2020 ..... 38
Figure 14. Instruments deployed by public investors, 2015–2020 (million USD) ..... 38
Figure 15. Instruments deployed by private investors, 2015–2020 (million USD) ..... 39
Figure 16. Green investment ambition 2021–2022 per programmatic solution (million USD) ..... 48


## LIST OF TABLES


Table 1. Summary of investment risks ..... 12
Table 2. GGGI's project preparation approach ..... 14
Table 3. Main documents and analysis in project preparation ..... 15
Table 4. List of sustainable landscapes projects, 2015–2020 ..... 23
Table 5. List of solar PV projects, 2015–2020 ..... 25
Table 6. List of NFVs, 2015–2020 ..... 29
Table 7. List of MSW projects, 2015–2020 ..... 31
Table 8. List of sustainable mobility projects, 2015–2020 ..... 33
Table 9. List of projects bundled under cross-cutting, 2015–2020 ..... 35
Table 10. Funding amounts and instruments by thematic area, 2015–2020 (million USD) ..... 39
Table 11. Sponsors and investors in green investment projects, 2015–2020 (million USD) ..... 41

# LIST OF FIGURES, TABLES, PICTURES, AND BOXES

## LIST OF PICTURES


Picture 1. Map of East Kalimantan (Source: GGGI) ..... 23
Picture 2. Livelihood of East Kalimantan (Source: GGGI) ..... 24
Picture 3. East Kalimantan Forest (Source: GGGI) ..... 24
Picture 4. The project site in 2021 (Source: GGGI) ..... 27
Picture 5. The project site in 2021 (Source: GGGI) ..... 27
Picture 6. Waste in Bac Ninh (Source: The Natural Waste in Bac Ninh Resources and Environment Newspaper) ..... 32
Picture 7. The initial construction at the project site at the end of 2020 (Source: GGGI) ..... 32
Picture 8. Cover page of the pre-feasibility study, published in 2018 (Source: GGGI) ..... 34
Picture 9. Cover page of the technical & financial analysis, published in 2020 (Source: GGGI) ..... 34
Picture 10. Deployment of the e-tricycles (Source: GGGI) ..... 43
Picture 11. Deployment of the tricycles (Source: GGGI) ..... 44
Picture 12. Launch of the e-tricycles (Source: GGGI) ..... 44
Picture 13. Implementation of the project (Source: FONERWA) ..... 44
Picture 14. Implementation of the project (Source: FONERWA) ..... 45
Picture 15. Implementation of the project (Source: FONERWA) ..... 45
Picture 16. The project site in Mahdia, Guyana (Source: GGGI) ..... 45
Picture 17. Geotechnical survey happening in Lethem in Feb. 2021 (Source: GGGI) ..... 46


## LIST OF BOXES


Box 1. A Critical Lack of Investible Green Projects in Developing Countries ..... 11
Box 2. East Kalimantan Jurisdictional Emission Reductions Program, Indonesia ..... 23
Box 3. Greening the Mumbai-Nagpur Expressway, Utility-Scale 250 MW Solar PV Project, India ..... 26
Box 4. Mongolia Green Finance Corporation, Mongolia ..... 29
Box 5. First Advanced Municipal Solid Waste-to-Energy Project, Viet Nam ..... 32
Box 6. E-mobility Program, Nepal ..... 34
Box 7. Evaluation of GGGI's Green Investment Services ..... 43

# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AE | Accredited Entity |
| ACGF | ASEAN Catalytic Green Finance Facility |
| ADB | Asian Development Bank |
| AIIB | Asia Infrastructure Investment Bank |
| CBP | Country Business Plan |
| $CO_2$ | Carbon dioxide |
| DFI | Development finance institution |
| EEPM | Energy and Environment Partnership Program with the Mekong Region |
| EESL | Energy Efficiency Services Limited (IN) |
| ERP | Emission Reductions Program |
| FCPF | Forest Carbon Partnership Facility (WB) |
| GCF | Green Climate Fund |
| GHGs | Greenhouse gases |
| GIG | Green Investment Group |
| GoI | Government of Indonesia |
| GoM | Government of Mongolia |
| GoN | Government of Nepal |
| IFC | International Finance Corporation |
| ISA | International Solar Alliance |
| KOICA | Korea International Cooperation Agency |
| LDCs | Least developed countries |
| LoI | Letter of intent |
| MDB | Multilateral development bank |
| Mha | Million hectares |
| MoU | Memorandum of understanding |
| MGFC | Mongolia Green Finance Corporation |
| MSEDCL | Maharashtra State Electricity Distribution Company Limited |
| MSRDC | Maharashtra State Road Development Company |
| MW | Megawatt |
| NDB | National development bank |
| NDC | Nationally Determined Contribution |
| NFV | National financing vehicle |
| PPA | Power purchase agreement |
| PPP | Public-private partnership |
| RBF | Results-based financing |
| REC | Rural Electrification Corporation Limited |
| REDD+ | Reducing emissions from deforestation and forest degradation |
| SDGs | UN Sustainable Development Goals |
| SIDS | Small Island Developing Countries |
| SME | Small and medium-sized enterprise |
| SPV | Special purpose vehicle |
| $tCO_2e$ | One ton of carbon dioxide equivalent |
| UNCTAD | United Nations Conference on Trade and Development |
| WB | World Bank |

# EXECUTIVE SUMMARY

There is an urgent need today to increase the flows of investment into developing countries and emerging markets to meet the targets of the Paris Agreement and the UN Sustainable Development Goals (SDGs) by 2030. Significant volumes of green climate finance have been pledged by governments to reach these targets and goals, and commercial capital is available for investment in bankable green climate projects in emerging markets. But these public and private funds are not being invested in projects as expected. Among the principal reasons are a challenging and complex climate finance ecosystem and a shortage of green climate projects that are financially, economically, and technically feasible. For such reasons, the development of strong pipelines of investible and bankable projects has become a key priority to unlock public and private funding earmarked for green climate projects in developing countries.

Established as a treaty-based international organization in 2012, GGGI originally focused on providing capacity building, sector planning, and knowledge products to enable the green transformation of Members. In 2014, GGGI and its Members decided to expand GGGI's remit to include the preparation of pipelines of green climate projects that are aligned with the environmental goals and economic development plans of Members. Since then, GGGI has focused specifically on three different types of financial products, namely green projects, financial instruments, and national financing vehicles (NFVs).

This report shows that since 2015, GGGI has made a significant contribution to the global climate finance ecosystem by explicitly concentrating its efforts on origination, structuring, and investor mobilization to accelerate the development of a pipeline of investible and bankable green projects. More concretely, GGGI has helped overcome the obstacles and challenges faced by its Members and partners during the upstream or early-stage conceptual and preparatory phases in project preparation by providing market reports, technical assessments, and financial and economic analyses. GGGI exits the project when it has been matched with an investor making the required initial investment commitment.

This report documents that during 2015–2020, GGGI mobilized USD 2.05 billion in initial green climate finance commitments for its Members. The number of projects increased annually, and 59 green projects in total were prepared over this period. This mobilization amount and the number of projects mark a sharp increase compared to the results in the previous period. The biggest sector, in terms of commitment mobilization, was Sustainable Landscapes, for which USD 1.19 billion in commitments was mobilized. This was followed by Solar PV with a total of USD 367 million. NFVs and especially Waste Management and Sustainable Mobility were more recent areas of engagement and showed considerable mobilization potential. A general increase overall in the number of projects prepared over time is evident. Clear trends in the number of projects and project sizes at the level of sectors were also observed. Differences across the regions and sectors included in the global portfolio were also evident.

The report shows that GGGI mobilized commitments from a wide range of public and private investors. Commercial investors accounted for the biggest total commitment amount, while development agencies were the biggest source of public funding. More precisely, the private sector accounted for USD 851 million, 41% of the total green finance commitments mobilized over 2015–2020. The amount of private sector finance mobilized increased during 2018–2020. In 2020, the private sector contributed no less than USD 307 million, 64% of the USD 476 million of green climate finance mobilized that year.

As demonstrated in this report, the level and the types of engagement by public and private investors varied significantly by sector. Sustainable Forests projects were supported by large public performance grants, results-based financing (RBF), and straight public grants. Funding for solar energy was first and foremost provided by private investors committing equity and debt. GGGI supported eight NFVs that were designed to attract international green finance and "retail" this funding at the national level. The first GGGI-conceptualized

NFV to be fully financed, the USD 50 million Mongolia Green Finance Corporation (MGFC), received a USD 27 million investment by the Green Climate Fund (GCF) in 2020. Funding for NFVs mostly came from local and international public investors who preferred grants, but in some cases, local governments and global climate funds provided both debt and equity. The Waste Management sector included both examples of companies mobilizing financing for profitable projects and development finance institutions providing concessional funding to catalyze private investment into pioneering projects. Sustainable Mobility was supported exclusively by public funding. Finally, the Cross-Cutting segment, which was a more diverse segment, was supported both by public and private investors.

The report finally makes recommendations for increasing the mobilization volume in the next phase in line with GGGI's *Strategy 2030*. In general, GGGI's project preparation should continue to aim to identify and structure sustainable, scalable, and impactful business models. Six specific mobilization strategies are detailed in the report. Several of these strategies are already being implemented by GGGI.

*Blended Finance*: Public funding has been a key source of finance, especially for projects that are commercially unviable. GGGI's experience confirms that access to concessional finance from public sources is often necessary to unlock private sector capital. Green investment projects in developing countries are often characterized by risk and uncertainty so that "de-risking" and credit enhancement techniques are needed to engage commercial capital. There is a strong need for effective blended concessional finance structures to bridge the large climate financing gap between projects and finance.

*Replication and Upscaling*: Aggregation and programmatic approaches are significant models for increasing the flows of climate funding. GGGI has already helped develop several projects that bundle smaller renewables and energy efficiency technologies to reduce transaction costs and increase the overall ticket size. In the same vein, GGGI should pursue multi-country programs with similar investment designs or regulatory frameworks (where these are crucial) as a cost-effective approach to scaling emerging technologies and pioneering new business models.

*Greening the Financial Sector*: GGGI should continue its work on the development of road maps and frameworks for green bonds and thematic bonds more generally in emerging markets. This will include strengthening institutional capacity to perform pre-issuance steps and meeting reporting and disclosure requirements. Another emerging priority is the greening of national development banks (NDBs). GGGI should continue to focus on the integration of environmental, social, and governance standards into investment eligibility criteria and due diligence processes.

*Carbon Pricing*: Since 2020, GGGI has been supporting Members in setting a price for carbon transactions and in accessing carbon finance. Carbon finance is one of the key financial mechanisms in the Paris Agreement and could potentially mobilize large volumes of private capital needed for meeting its targets and finance the implementation of the Nationally Determined Contributions (NDCs) under this Agreement.

*Climate Adaptation*: GGGI is already working on several climate-smart agriculture projects and will continue to ensure that all projects comply with relevant internal safeguard policies and procedures and are designed or modified as necessary to adapt to climatic variability and climate extremes. During 2015–2020, GGGI helped mobilize around USD 210 million for the financing of adaptation and climate resilience projects of Members.

*Partnerships*: GGGI should prioritize developing and deepening partnerships with strategic investors, financial institutions, and platforms with a deep understanding of and a long-term commitment to green growth in developing countries and emerging markets.

Finally, the report includes two annexes. Annex 1 provides a complete list of the 59 green climate projects developed by GGGI from 2015 to 2020. Annex 2 gives short summaries of these 59 projects.

# 1 INTRODUCTION

GGGI was established as a treaty-based intergovernmental organization in 2012. GGGI's mandate is to promote green growth by helping Members create the enabling environment needed to facilitate the transition to a low-carbon, resilient world of strong, inclusive, and sustainable growth. In 2014, GGGI and its Members agreed to expand the focus of the organization's work to include development of green investment projects in addition to policy planning, capacity strengthening, and knowledge building needed for the green transformation.[1] GGGI has since then pursued both thematic foci in its work.

There is a strong and urgent need to increase flows of investment into green infrastructure, manufacturing, agriculture, and forest conservation in developing countries. United Nations Conference on Trade and Development (UNCTAD) estimates that to meet the UN SDGs by 2030, the total annual investment needs for developing countries range from USD 3.3 trillion to USD 4.5 trillion. Such estimates translate into an annual financial gap of USD 2.5 trillion between the funding that is currently available and what is required.[2] At the same time, it is generally recognized that ample amounts of public and especially private finance are available for bankable green investment projects, but there is a shortage of investible projects in developing countries that could absorb the available amounts of finance. Recognizing both these issues, it was decided in 2014 that GGGI would be concerned with the development of concrete green projects for its Members. Specifically, GGGI would focus on project initiation and origination (i.e., the initial steps in project development) to accelerate and increase the number of new green projects that reach financial close.

GGGI mobilized around USD 2.1 billion in green climate finance commitments for its Members over the period 2015–2020. This result should be compared against the target of USD 600 million set in the *GGGI Refreshed Strategic Plan 2015–2020*.[3] This report takes stock of GGGI's efforts to develop and bring forward a pipeline of investible green climate projects that will mobilize green investment flows into GGGI Member countries and regional integration organizations. Chapter 2 describes GGGI's three-phase approach to project preparation and GGGI's "exit" from projects. Chapter 3 presents a portfolio of 59 projects developed from 2015 to 2020 across the Sustainable Forests, Solar PV, NFVs, Waste Management, and Sustainable Mobility sectors of GGGI Members.[4] In Chapter 4, the report gives examples of projects that GGGI has initiated in these sectors. Chapter 5 presents an overview of the financial instruments selected to finance GGGI's green investment projects and the types of funding that GGGI mobilized. Chapter 6 looks at the sponsors and investors that made commitments to invest in GGGI's green climate project. Chapter 7 presents examples of green climate projects that have advanced beyond financial close and are either under construction or in operation today. Chapter 8 discusses the prospects for GGGI's continued engagement in origination and project preparation in the medium and longer term. Finally, Chapter 9 presents the report conclusions and recommendations.

1 The term "projects" refers to the three products that GIS is currently working on (i.e., projects, financial instruments, and NFVs).

2 See Convergence, The State of Blended Finance 2020. UNCTAD, "World Investment Report: Investing in the SDGs: An Action Plan." (UNCTAD, 2014).

3 GGGI, Refreshed Strategic Plan 2015-2020: Accelerating the Transition to a New Model of Growth (GGGI, 2017).

4 For Programmatic Solution no. 4 (Sustainable Forests), no. 6 (Waste Management), no. 7 (Sustainable Mobility), and no. 9 (Solar PV), see GGGI, *Roadmap to Implement Strategy 2030*. Global Green Growth Institute, Eleventh Meeting of the Management and Program Sub-Committee, May 1, 2020, Seoul, Republic of Korea. MPSC/2020/2.

# CLOSING THE CLIMATE FINANCING GAP

# 2

There is a critical financing gap today between projects and finance due to three primary reasons. First, projects are often not bankable and do not match the risk-reward ratio of investors. Second, a mismatch between financial instruments and projects occurs when projects are not at the required scale needed to attract finance or when financial instruments (e.g., bonds) can't be fitted to the size of available projects. Third, developing countries routinely lack the institutional capacity to manage funds in line with the needs of investors. These problems are not mutually exclusive but instead interrelated, and they manifest themselves in different ways in different sectors.[5]

### Box 1. A Critical Lack of Investible Green Projects in Developing Countries

There is a consensus within the international financial community that a shortage of investment-ready or finance-ready projects is one of the key challenges in achieving the green transformation in developing countries. These projects are sometimes referred to as shovel-ready projects, or projects that are ready for construction and employment. This point has been raised by international independent think tanks, noting "that the main barrier to increased investment is not a lack of available finance, but rather a lack of well-prepared and investment-ready bankable projects," and that this lack of projects then creates "a key constraint to achieving global climate and development objectives."[6] According to one MDB official, "There are simply not enough viable projects out there."[7] An ADB official recently phrased the issue in terms of three gap areas, namely "a skills gap to structure innovative impactful projects, a lack of speed and scale in the volume of climate projects emerging, and a poor understanding of a holistic 'green impacts' approach."[8] In 2020, in response to this challenge, the International Finance Corporation (IFC), the private sector arm of the World Bank Group, as part of its recent Upstream initiative, significantly expanded its capacity to develop project ideas, conduct feasibility studies, and design projects by recruiting more than 200 new staff.[9]

GGGI is responding to this challenge by following a value chain approach that begins on the left, with the introduction of green growth into national planning, and then moves to the right, toward project preparation and financing. Specifically, this means that GGGI works on developing a portfolio of investment opportunities that includes (i) projects taken to bankability, (ii) capital market and risk mitigation instruments, and (iii) NFVs.


**Figure 1. GGGI's value chain**

Bankable projects are projects that generate sufficient cash flow to cover all project-related costs as well as a reasonable rate of return to investors. It is widely understood to be the point at which commercial capital is ready to make an investment. In cases where cash flows are insufficient to fully cover project costs, a project can be made bankable by subsidies or other forms of concessionary capital using instruments that either

5 See GGGI, *Closing the Financing Gap: Understanding "bankability," risks and how GGGI supports countries to access green finance.* GGGI Submission to Council, January 2018.

6 See Darius Nassiry and Smita Nakhooda with Sam Barnard, *Finding the Pipeline: Project Preparation for Sustainable Infrastructure*, p. 16.

7 Quoted in Aaron Bielenberg, Mike Kerlin, Jeremy Oppenheim, and Melissa Roberts, *Financing Change: How to Mobilize Private Sector Financing for Sustainable Infrastructure*, p. 30.

8 See ADB, ASEAN Catalytic Green Finance Facility 2019-2020. *Accelerating Green Finance in Southeast Asia*. p. vii.

9 See IFC, *Transformation. IFC Annual Report 2020*. p. 10.

meet the gap in cash flows or lower the cost of capital for the project to enable a reasonable rate of return for investors.

Projects are fraught with different types of risk. The GGGI Insight Brief *Mind the Gap* has identified five risk categories that affect projects: political, regulatory, technology, credit, and capital market risks (see Table 1).[10] Such risks must be overcome before investments can be made. Where risks increase the cost of financing, costs can be reduced through subsidies and instruments that provide risk mitigation, such as guarantees and credit enhancement pools.

**Table 1. Summary of investment risks**

| Category of Risk | Common Examples |
|---|---|
| Political Risk | • Unstable political environment<br>• National and local security concerns<br>• Changes in national or local government support for climate projects |
| Regulatory Risk | • Policies that promote business-as-usual "brown" growth (e.g., fossil fuel subsidies, restrictive permitting and licensing)<br>• Lack of enabling policies (e.g., feed-in tariffs, tax incentives)<br>• Weak legal frameworks and limited enforcement of regulations<br>• Regulatory changes that adversely impact projects<br>• Frequent changes to regulations that create instability |
| Technology Risk | • Technology underperformance<br>• Lack of in-country expertise in construction of climate projects<br>• Lack of in-country expertise in operations and maintenance of technologies<br>• Inadequate supporting infrastructure (e.g., information and communications technology, transmission, and distribution) |
| Credit Risk | • Counterparty creditworthiness, risk of default or non-payment<br>• Counterparty expertise<br>• Limited national and local experience with project management<br>• End-user payment for public services |
| Capital Market Risk | • Immature national and local financial markets<br>• Lack of pipelines of bankable projects<br>• Lack of liquidity<br>• Currency fluctuations and depreciation<br>• High transaction costs<br>• Front-loaded cost structure |

*Source: GGGI Insight Brief 1, Mind the Gap: Bridging the Climate Financing Gap with Innovative Financial Mechanisms (GGGI: 2016).*

Because of the distinctly different conditions in which GGGI operates, achieving bankability may not always be possible. This means that not all projects are bankable and/or can be made bankable within a certain time frame. However, given that substantial capital flows will need to come from the private sector, it is imperative that GGGI find ways to reduce the investment risks for projects and make them bankable or investable. The overall aim is to use the minimum amount of scarce public capital efficiently to reduce risk and leverage private capital.[11] GGGI will endeavor to change the risk profile of projects to an acceptable level for private sector capital (see Figure 2).

10 This is not a complete list. Additional risks—environmental and social risks, execution capacity of the project operator, corruption, and others—are also being considered by investors. See I.M.D. Little and J.A. Mirrless, *Project Appraisal and Planning for Developing Countries* (New York: Basic Books, 1974); R. Y. Redlinger, P. D. Andersen and P.E. Morthorst, *Wind Energy in the 21st Century* (New York: Palgrave, 2002), pp. 97-122; and J. Delmon, *Private Sector Investment in Infrastructure: Project Finance, PPP Projects, and PPP Frameworks* (Alphen an den Rijn: Wolters Kluwer, 2016), pp. 105-152.

11 For instance, by reducing the extent, amount, and time duration.

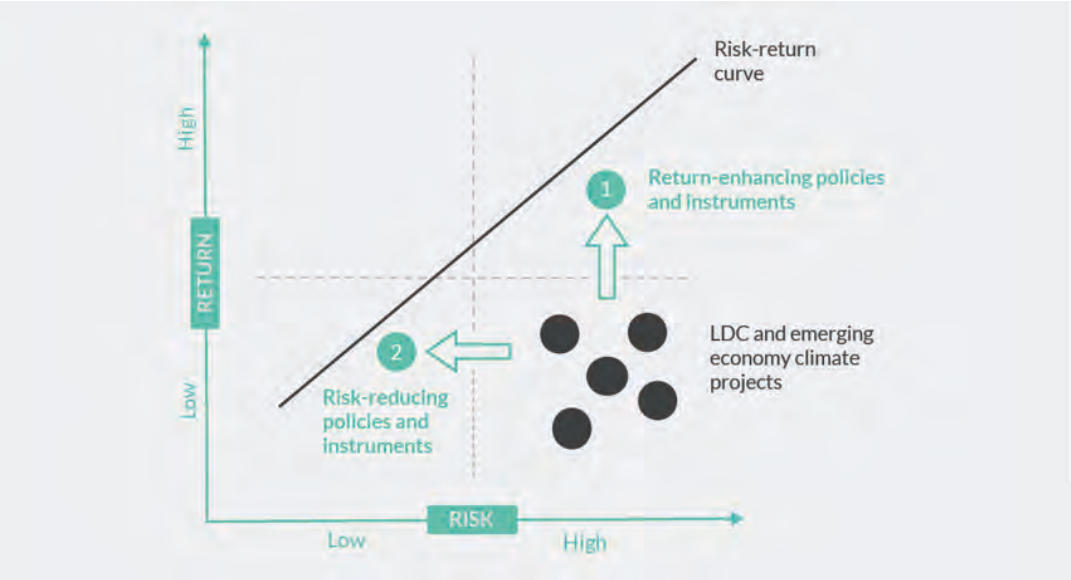



**Figure 2. Risk-return for climate projects**

*Source: GGGI Insight Brief 1, Mind the Gap: Bridging the Climate Financing Gap with Innovative Financial Mechanisms (GGGI: 2016).*

GGGI will strive to access private capital wherever possible, meaning GGGI will bring projects to a point that they can leverage a variety of financial instruments both from public and private sources. This means designing projects to reduce or completely mitigate the risks so that they can access investment finance—loans, equity, grants and/or blended capital. In short, GGGI will aim to make projects investable.

Projects are not the only way to bridge the financing gap. GGGI also designs risk-reducing financial instruments and NFVs. Financial instruments such as bonds sometimes provide the most suitable solutions to meet the financing challenges faced by investors, for aggregation of projects, for growth of new markets, to attract new investors, and to help channel capital into new climate-friendly investment in developing countries. They are sometimes better suited to achieving impact than a single project. Financial instruments include thematic bonds, guarantees, and insurance, among others.

NFVs are essentially funds set up in countries that are capable of channeling green climate finance, grants, and other instruments to a pipeline of projects. These vehicles are designed with governance systems capable of handling international funding. NFVs can range from simple grant-making funds to more complex handling of debt or other forms of instruments. GGGI works to design and establish such entities when they offer an effective practical solution.

## GGGI's Approach to Project Preparation

Project preparation funding, financial skills, technical expertise, and persistency are all required to develop an investible green project. It may also take considerable time, often several years, from project identification to project construction, particularly for large-scale infrastructure projects. This is even more true in a developing country context.[12] Although beyond the scope of GGGI's project preparation work, government review and approval processes in developing countries are often lengthy and uncertain, further discouraging developers and investors.[13]

12 Large-scale infrastructure projects in Africa may take 7–10 years from identification to financial close and an additional 3–5 years for construction. See Darius Nassiry and Smita Nakhooda with Sam Barnard, *Finding the Pipeline: Project Preparation for Sustainable Infrastructure*, p. 12.

13 See the World Bank's *Doing Business* initiative. *Doing Business 2020*. For early examples from the Philippines, Haiti, and Egypt, see Hernando De Soto, *The Mystery of Capital* (Basic Books, 2000).

GGGI performs the role of an arranger, namely designing and structuring commercially viable projects that will attract appropriate finance. As experienced and dedicated developers of green climate projects, GGGI staff proactively focuses on strengthening both the commercial viability and the social impact of projects.

- GGGI aims to mobilize the initial commitment from financiers and project developers to further advance and invest in climate projects of Members and partners.
- To this end, GGGI works with private and public investors and policymakers to develop bankable projects, design financial instruments, and establish NFVs.

GGGI's project development activities pre-financial close are divided into three phases—the Concept, Design, and Financing phases, respectively. In Phase I, GGGI staff work to develop the project concept so that it becomes viable. A green development project is intended to provide a product or a service that will meet an identified but unmet demand in society or in the market.[14] The fundamentals of the project idea constitute the core project concept. In Phase II, GGGI staff help to structure the project so that risks are reduced or transferred to parties that can bear and manage risks, or both, and it becomes investible and bankable. GGGI examines the environmental, financial, technical, and socioeconomic specifics of the project during this phase. Phase III, or Financing, involves the development and finalization of term sheets and financing agreements. GGGI will help market the project to potential investors and funders to attract the interest of committed and suitable investors and funders.

Since 2015, GGGI has increased its in-house expertise and capacity to conduct project preparation activities and has significantly reduced inputs from external experts. The GGGI approach to upstream project development and preparation is summarized in Table 2.

**Table 2. GGGI's project preparation approach**

| Phase I: Concept |
|---|
| • GGGI appointed as an advisor or received a mandate from the government<br>• Project at early stages of development<br>• Scoping study or pre-feasibility analysis initiated or ongoing |
| **Phase II: Design** |
| • Feasibility study at an advanced stage or completed<br>• Specific investment opportunity identified and the commercial viability well established<br>• Design of the project implementation structure and key contracts under progress |
| **Phase III: Financing** |
| • Indicative terms of key project contracts agreed in principle with the main stakeholders<br>• Comprehensive project information memorandum or funding proposal completed<br>• Upon investors' initial commitment, in-depth project planning and engineering commences and progresses toward firm investor commitments |

Most but not all projects prepared during 2015–2020 moved through all three phases. In Phase I, GGGI provided the required staff and expertise needed to perform the initial analyses and assessments to validate the project concept. Sometimes a viable concept already existed, and GGGI would then concentrate on structuring and designing a project that could successfully implement the project concept. Occasionally, GGGI engaged on projects that were well advanced in design and structure. In such cases, GGGI's value-add was primarily to contribute to the mobilization of the needed investment commitments.

14 A project could also deliver a product or a service that is less expensive and offers other improvements relative to existing products or services.

Achievement of the required initial investor commitments marks the final step in GGGI's project preparation. GGGI exits the green investment project when the initial commitments to finance the project are made—that is, GGGI makes a deliberate exit from a project at the point where the required proven initial investment commitments for the specific project are made. Accordingly, project completion, implementation, and operation are led by the companies and parties that will finance, build, own, operate, and maintain the green projects. The early-stage or initial commitments are agreed in the form of a signed letter of intent (LoI), draft term sheets, or a memorandum of understanding (MoU) submitted to GGGI. In case of national and international public organizations, GGGI receives a signed Letter of Appreciation or an MoU submitted by the funding party for co-signing by GGGI. The key documents and analyses prepared during project preparation are listed in Table 3.

**Table 3. Main documents and analysis in project preparation**

| Phases I–III | Documents | Analysis/due diligence |
|---|---|---|
| Concept | a. Project Idea Note<br>b. Project log-frame (with deliverables & timeline) | a. Scoping study<br>b. Preliminary financial model |
| Design | c. Information Memorandum (Info Memo) | c. Pre-feasibility study, market assessment<br>d. Assessments of policies, regulations, etc.<br>e. Detailed financial model<br>f. Contractual, legal assessments (PPA[15], PPP[16], etc.)<br>g. ESG[17] |
| Financing | d. LoI, draft term sheet, MOU, etc. | h. Investor brief/teaser<br>i. Investor slide deck |

## Conclusions

In 2014, it was decided that GGGI would also be concerned with the development of concrete green projects. Specifically, GGGI would focus on project initiation and origination, namely the initial steps in project development, to accelerate and increase the number of new green projects that reach financial close. Today, it is routinely observed that there is a lack of investible green projects in developing countries. Acknowledging this issue, multilateral and regional development banks have recently begun to take steps to strengthen and accelerate origination of green climate project pipelines. GGGI is currently partnering with the Asian Development Bank (ADB) in the context of the ASEAN Catalytic Green Finance Facility (ACGF) and is contributing to origination and project structuring.

The approach taken by GGGI distinguishes it as an intergovernmental organization. GGGI concentrates deliberately and explicitly on overcoming the obstacles and challenges faced by green investments and climate projects, especially in the upstream conceptual and preparatory phases. Figure 3 shows GGGI's niche among various organizations, providing support to different types of projects: fully grant funded on the left, commercial investors on the right, and high-risk/low-return projects in the middle that require support to become bankable and attract concessional or commercial finance.

15 Power purchase agreement.
16 Public-private partnership.
17 Environmental, social, and corporate governance aspects.

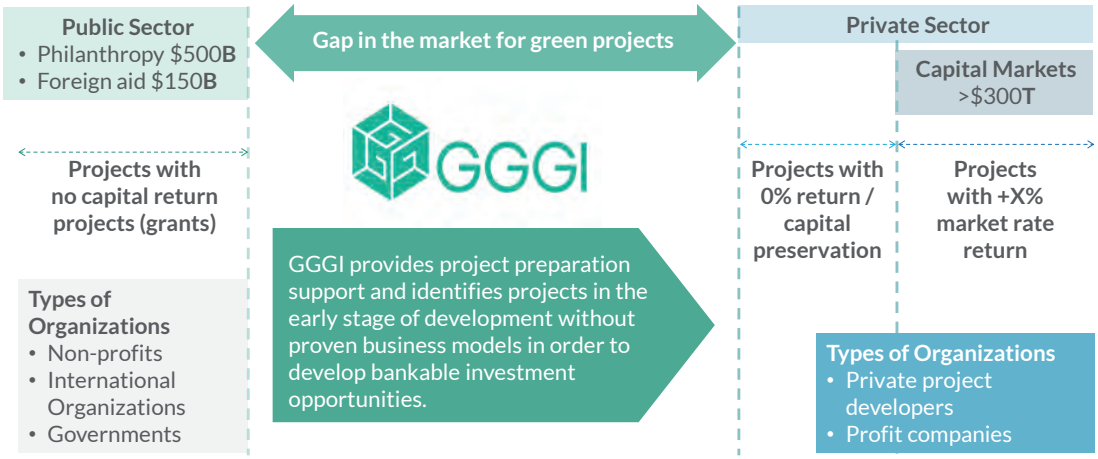



**Figure 3. Overview of the ecosystem for green investment services** [18]

18 See GGGI Main Evaluation Report, *Evaluation of GGGI's Green Investment Services*, p. 18.

# A GROWING GLOBAL PORTFOLIO OF GREEN INVESTMENT PROJECTS

# 3

## Global Portfolio

GGGI's efforts in green projects origination have increased significantly since the first four projects were prepared and completed in 2015. By the end of 2020, the portfolio of green climate investment projects included 59 projects. As per GGGI's *Strategy 2030*, continued growth, both in the number and size of projects, is expected in the next phase.[19]

It is useful to first review the global portfolio and the regional portfolios built over the course of 2015–2020. Chapter 4 will then take a closer look at the key thematic sectors and areas in the global portfolio. In 2015, GGGI mobilized four commitments worth a total of USD 131 million. In 2016, commitments for two sizable REDD+[20] projects for a total value of USD 105 million were mobilized. In 2017, 10 commitments worth a total of USD 525 million were added to the portfolio, and in 2018, no fewer than 17 commitments worth a total of USD 456 million were made. In 2019, 21 commitments worth USD 358 million were attained. Finally, in 2020, the most recent year, 16 commitments for a total value of USD 476 million were made.[21] Therefore, GGGI has prepared 16–21 commitments annually over the course of 2018–2020. Total annual commitments have remained consistent over this period, averaging around USD 430 million per year.

The entire portfolio of green climate investment commitments mobilized over 2015–2020 amounts to USD 2.05 billion. Figure 4 shows the annual and cumulative figures over the period. The full list of 59 projects is presented in Annex 1.

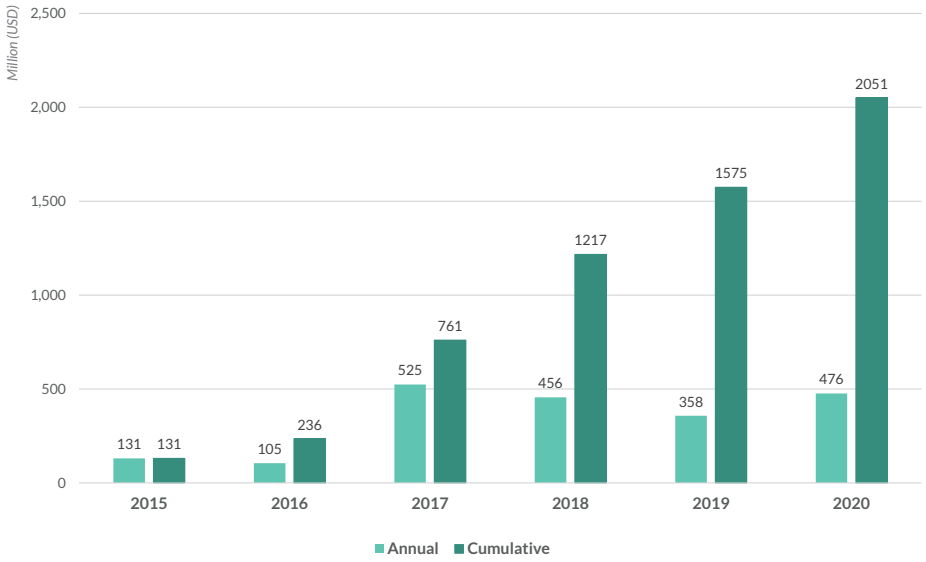



**Figure 4. Annual and cumulative investment commitments, 2015–2020 (million USD)**

19 GGGI has developed three scenarios for annual investment mobilization growth by 2030: (1) the Minimum Scenario of USD 1.4 bn, the Optimum Scenario of USD 2 bn, and the Maximum Scenario of USD 2.8. *GGGI Strategy 2030* (GGGI, 2019), pp. 30-31.

20 Reducing emissions from deforestation and forest degradation.

21 The figures in this paragraph refer to the investment commitments made in that year and not to the close of the initial commitments for a project. While commitment mobilization is typically completed within one calendar year, it occasionally takes longer, or commitments are made within one year but across two different calendar years. The year in which the initial investor commitments were made are indicated by project in Chapter 4.

Since 2015, GGGI has gradually expanded the range of sectors due to the increase in in-house technical capacity and project preparation skills and to better address the needs of Members. In the early phase, GGGI focused predominantly on sustainable land-use systems and smaller-size renewables. NFVs and electric mobility were early priority areas too. Other sectors or thematic areas were added later. Principal among those sectors are municipal solid waste and, to some degree, energy efficiency in small and medium-sized enterprises (SMEs) and public buildings. Figure 5 shows the portfolio in terms of sectors, cumulatively, over the period.

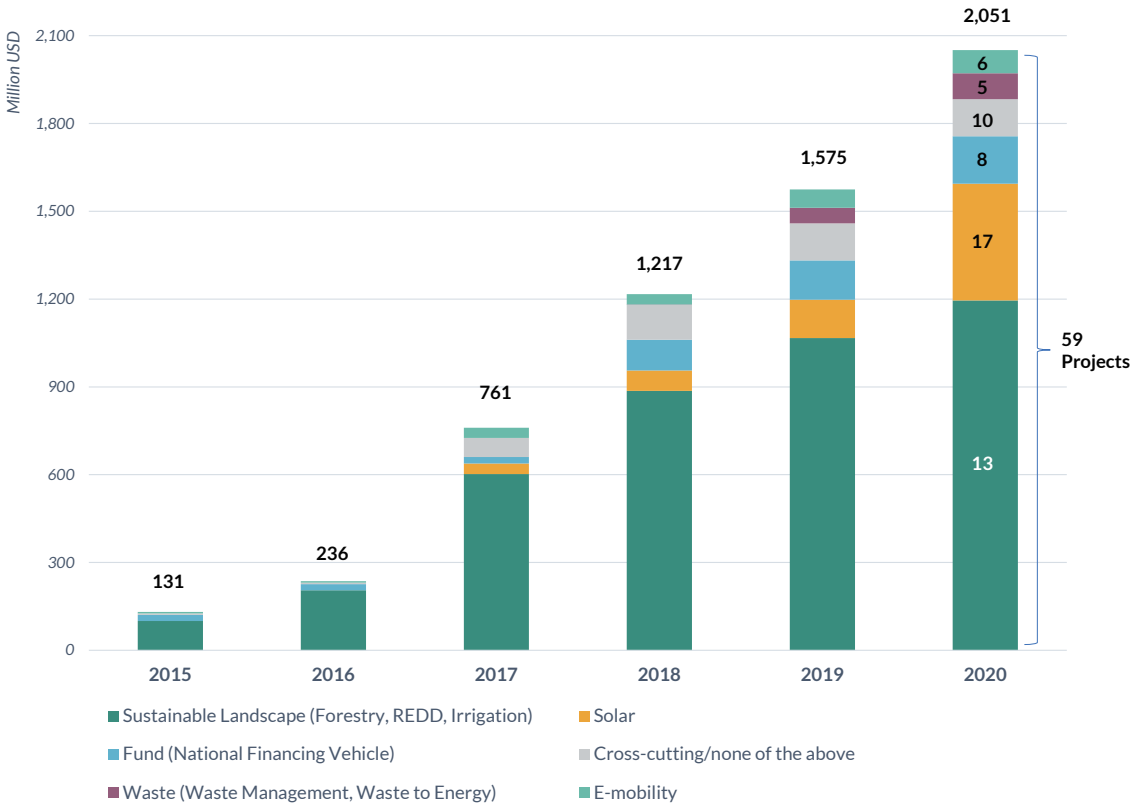



**Figure 5. Portfolio in terms of sectors, cumulatively, 2015–2020 (million USD)**

The following indicate the number of projects and mobilization amounts by sector: USD 1.2 billion in 13 Sustainable Forests projects, USD 399 million in 17 Solar PV projects, USD 162 million in eight NFVs, USD 80 million in six Sustainable Mobility projects, and USD 88 million in Waste Management projects. Finally, 10 other/cross-cutting projects have mobilized USD 127 million. Figure 6 shows the relative size of the key sectors in the global portfolio in terms of commitments. Figure 7 shows the proportion of projects across sectors for all 59 projects.

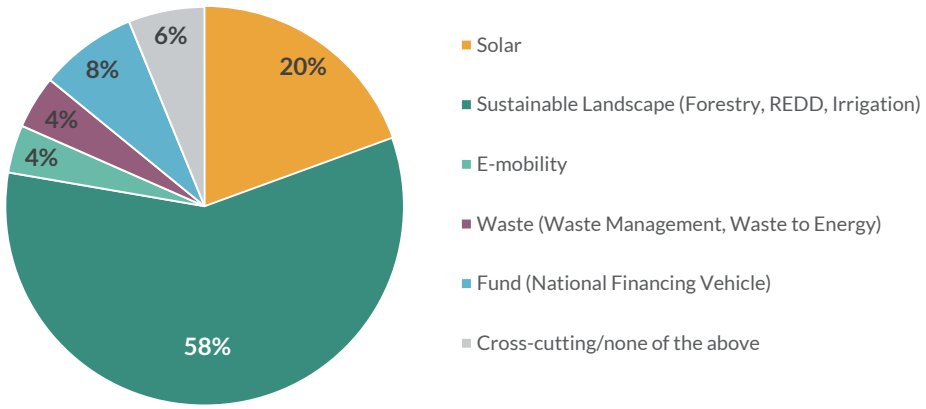



**Figure 6. Proportion of mobilized commitments across key sectors/themes**

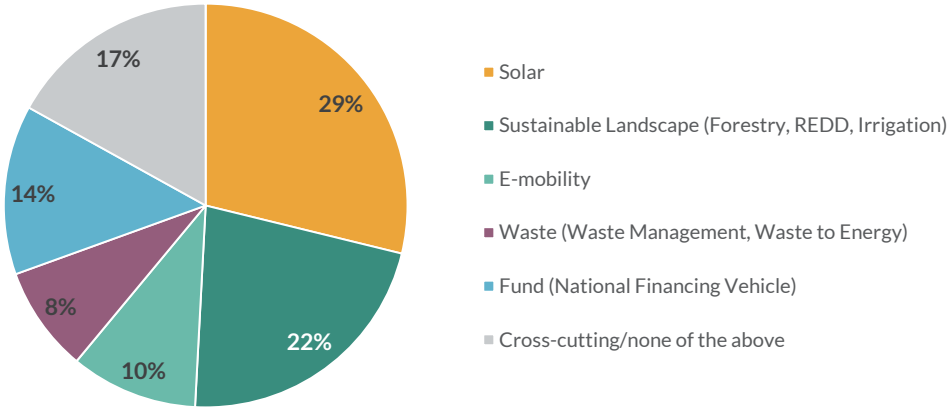



**Figure 7. Proportion of projects across sectors/themes**

## Regional Portfolios

The project portfolio reflects that GGGI has embedded teams across Asia, Africa, Latin America, the Middle East, and the Pacific region. GGGI is furthermore supporting early-stage projects for partners. Around one third of all projects are in the Asia region, one quarter in Africa, one fifth in Latin America, and one sixth in the Pacific region. The regional distribution of the 59 projects is shown in Figure 8.

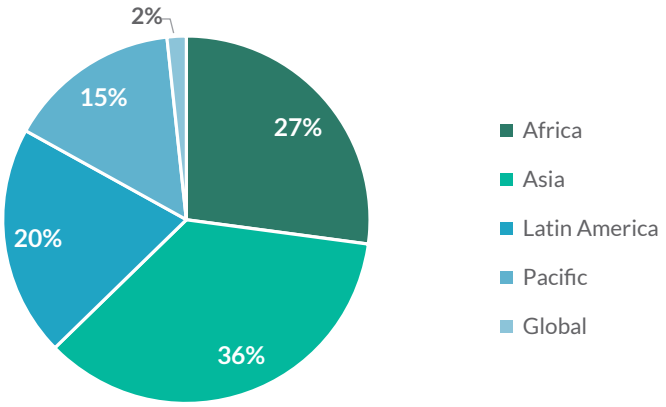



**Figure 8. Proportion of projects across regions**

It is also useful to review the distribution of the investment commitments by region. As shown in Figure 9, the three largest regions—Asia (USD 757 million), Africa (USD 691 million), and Latin America (USD 531 million)—have together mobilized around 90% of the total amount. The Pacific region has mobilized a smaller amount (USD 67 million), which is not surprising given the smaller size of the economies in the Pacific region.

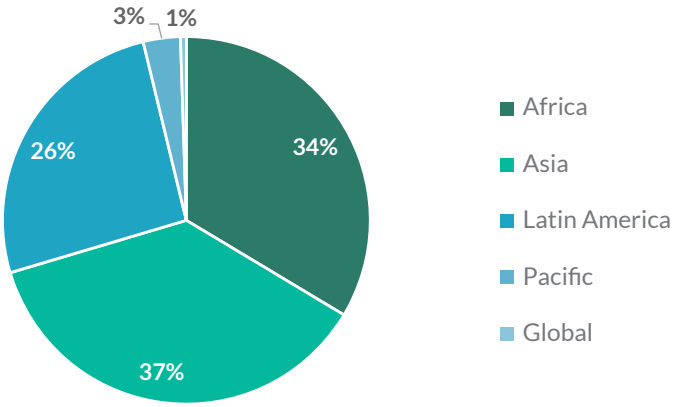



**Figure 9. Proportion of commitments across regions**

Some important regional differences should also be noted. These differences exist because the Latin America, Asia, and Africa portfolios—but less so the Pacific portfolio—show somewhat skewed distributions of projects according to size and the number of large-size projects. The Latin America portfolio includes some large projects, some medium-size projects, and some small projects; the Asia portfolio shares similar characteristics but includes a high number of small-size projects; and the Africa portfolio includes one very big project and the highest number of small-size projects. The Pacific portfolio is more homogeneous in comparison, with the biggest project being USD 20 million.

These regional differences are not evident when comparing the number of projects, commitment amounts, and average project sizes across the regions. Consequently, to recognize the differences in the composition of the regional portfolios, it is more instructive to review and compare median project sizes rather than average sizes. The median project sizes are as follows: Latin America portfolio, USD 19.4 million; Asia portfolio, USD 16.8 million; Africa portfolio, USD 7.5 million; and Pacific portfolio, USD 3.5 million (see Figure 10).

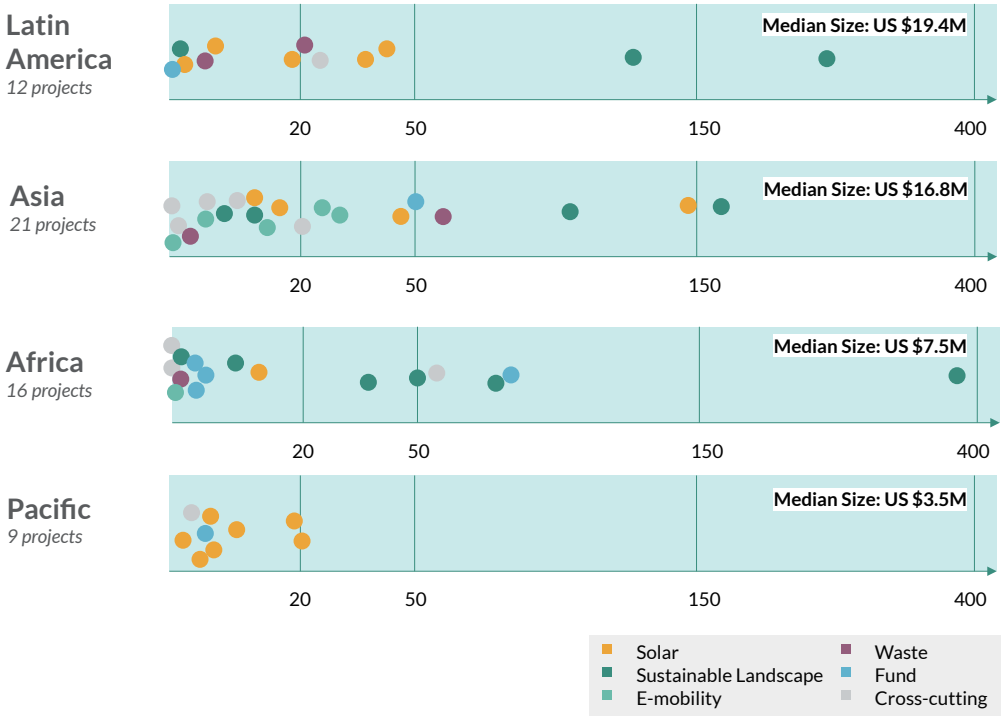



**Figure 10. Regional portfolios of projects (million USD)**

## Conclusions

GGGI has mobilized USD 2.1 billion in early-stage green climate investment commitments for 59 green climate projects from 2015 to 2020. The number of projects per year has grown during this six-year period. In the early start-up years, the projects were often spread across many significantly different sectors and varied considerably in size. In more recent years, projects have largely been concentrated in five primary sectors. Sustainable Forests projects were usually sizeable, making this sector the largest overall in capital mobilization. The number of Solar PV projects has been growing steadily over the years, though, and this sector is the second largest in total amount of mobilized capital. NFVs, Waste Management, and Sustainable Mobility have mobilized smaller amounts. This is because of the smaller first capitalization rounds for NFVs (bigger scaling-up rounds may follow later) and because GGGI engaged in these sectors only recently.

With respect to the global portfolio, while a general increase in the absolute number of projects over time is evident, there is no clear overall trend in the size of projects. Essentially, this is due to differences among the regions and sectors included in the global portfolio. As shown in Chapter 4, GGGI has been engaging in some sectors since 2015 but expanded into other sectors only more recently. Generally, the first projects are usually of a smaller size, but the size will increase over time in a scalable sector. The maturity of a sector and the extent and length of GGGI's engagement are thus important issues. That said, it is possible to observe trends in the number of projects and in project size at the level of individual sectors, especially in the case of solar energy. Solar energy is increasingly becoming a scalable renewables technology for various reasons noted in Chapter 4, whereas other technologies may not yet scale well.

# 4 THEMATIC OVERVIEW OF GREEN INVESTMENT PROJECTS

Chapter 4 will look more closely at the key themes and areas that GGGI's origination and structuring work concentrated on. It gives several examples of the actions and interventions made by GGGI staff during early-stage project preparation and structuring. Examples of the actual inputs prepared by GGGI are provided as well. The chapter also identifies the types of public and private financing that are typical for the sectors, including their degree of commercial sustainability and potential for replicability and standardization.

GGGI's investment commitment mobilization work has covered a considerable range of projects but has maintained a clear focus on GGGI's thematic priority areas. The five main thematic areas are Sustainable Forests, Solar PV, Sustainable Mobility, Waste Management, and NFVs. The first four thematic areas are programmatic solutions; NFVs are considered cross-cutting.

## Sustainable Forests

The "landscape approach" is central to GGGI's Sustainable Landscapes Strategy.[22] It takes a holistic view at a jurisdictional scale with an aim to sustain healthy forests, land, and marine environments. Green growth interventions in sectors that rely on these landscapes must be developed in the context of strong interdependence among sectors within one connected geographic landscape.

Most landscape interventions for GGGI have centered on the forestry sector as forests play a key role in climate change mitigation; agriculture, forestry, and other land uses are responsible for around 23% of annual global greenhouse gas (GHG) emissions. At the same time, forest conservation and restoration are among the most cost-effective options to reduce those emissions. In adaptation, forest landscapes play a crucial role through water provisioning services for agriculture, hydropower, and cities.

To date, GGGI has been exploring investment solutions for the restoration and management of forest landscapes, with successful results largely in RBF for REDD+ and ecosystem services projects. GGGI prepared policy interventions, such as national forest development plans and REDD+ strategies, to pilot investment projects on forest businesses and sustainable commodity productions and to set up accelerator funds for green forests and ecosystem services during 2015–2020. GGGI, through the stocktaking of existing projects and replication of good examples, will continue to focus on developing sustainable financing solutions for the sector by expanding engagements with financial institutions and impact investment funds interested in the forestry and landscape sector.

The current Sustainable Forests portfolio consists of 13 projects across four countries in three world regions. It adds up to USD 1.2 billion in total investment commitments.

22 Programmatic Solution no. 4. Sustainable Forests (REDD+, landscapes financing mechanisms, natural capital markets innovations), see GGGI, *Roadmap to Implement Strategy 2030*. Global Green Growth Institute, Eleventh Meeting of the Management and Program Sub-Committee, May 1, 2020, Seoul, Republic of Korea. MPSC/2020/2.

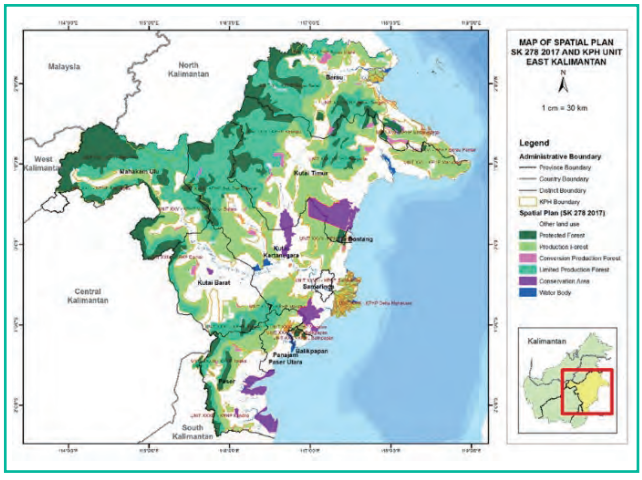
### Table 4. List of sustainable landscapes projects, 2015–2020

| # | Project Name | Country | Commitment (M USD) | Year |
|---|---|---|---|---|
| 1 | Amazon Vision Program REDD+ | Colombia | 100.0 | 2015 |
| | | | 25.0 | 2016 |
| 2 | Norway REDD+ Implementation through Partnership | Ethiopia | 80.0 | 2016 |
| 3 | Support for Rural Communities' Drought Resilience | Ethiopia | 10.0 | 2017 |
| 4 | GCF Irrigation Systems Support | Ethiopia | 50.0 | 2017 |
| 5 | Mekele City Water Project | Ethiopia | 337.0 | 2017 |
| 6 | Strengthening Climate Resilience of Rural Communities in Northern Rwanda (SCRNRP) | Rwanda | 33.0 | 2018 |
| 7 | Development of Eco-tourism Park in Kigali – Wetland, Nyangungu | Rwanda | 1.7 | 2018 |
| 8 | Joint Declaration of Intent on Deforestation – funding by Norway | Colombia | 250.0 | 2018 |
| 9 | East Kalimantan Jurisdictional Emission Reductions Program | Indonesia | 180.0 | 2019 |
| 10 | Central Kalimantan Logging Concessions for Conservation Project | Indonesia | 15.0 | 2020 |
| 11 | Sustainable Coconut Sugar Production to Improve Livelihoods | Indonesia | 8.0 | 2020 |
| 12 | Projects for GCF REDD+ Result Based Payment | Indonesia | 103.8 | 2020 |
| 13 | Financing for Amazoniko's Greener Business Expansion | Colombia | 2.0 | 2020 |
| | **Total** | | **1,195.5** | |

Seven of the projects in this sector follow an RBF approach in which payments will be made when pre-agreed payment milestones are reached during project implementation.

### Box 2. East Kalimantan Jurisdictional Emission Reductions Program, Indonesia

*Picture 1. Map of East Kalimantan (Source: GGGI)*




The Indonesian province of East Kalimantan generates an estimated 68.4 million tons of carbon dioxide equivalents ($tCO_2e$) annually due to deforestation and forest degradation. Forest conversion for oil palm plantations has been responsible for 51% of the recent deforestation, and over-logging and illegal logging have degraded natural habitats and ecosystem services. In 2000, 83% of East Kalimantan, or about 16 million hectares (Mha), was covered by natural forest, but 18% of this—over 3 Mha—was lost between 2001 and 2019. During this decade, the provincial government made commitments and took steps to reduce deforestation and shift its economy from dependence on extractive, unsustainable forest exploitation to a more sustainable development pathway. This history of high deforestation, together with a still-extensive forest area and capable institutions committed to green growth, were among the reasons for selecting the province for the first large-scale jurisdictional REDD+ program in Indonesia, to be financed by the Forest Carbon Partnership Facility (FCPF) Carbon Fund under an agreement between Indonesia and the World Bank (WB). The agreement was signed in 2020 and is intended to run until 2025, after which the avoidance of forest loss and emissions are expected to become permanent.

To curtail deforestation and forest degradation, an Emission Reductions Program (ERP) was designed to incentivize and enforce action in key sectors (forestry, agriculture, and mining); provide benefits to district and village governments; align government policies, plans, and systems with the goals of the program; and overcome underlying governance issues through initiating policy reform, involving private sectors, and engaging with local communities. The program, which covers the entire 12.7 Mha of forest in the province,

is globally important in addressing deforestation and climate change. Around half of that area is covered by primary (unlogged) tropical rainforest, which is home to a wealth of globally significant biodiversity and sustains the livelihoods of indigenous people and other local communities.

*Picture 2. Livelihood of East Kalimantan (Source: GGGI)*

The ERP, as a subnational implementation of Indonesia's national approach to climate change mitigation, is an important step toward the establishment of a national REDD+ framework and mechanism. It is a jurisdictional approach implemented and administered by the provincial government, in accordance with national policies and systems for monitoring, safeguards, and benefit-sharing. The ERP builds on the existing governance framework and is expected to have high effectiveness because of close collaboration between government agencies, companies, farmers, fishermen, and communities who manage the forest and often have substantial powers to shape land-use decisions. This is particularly relevant to ensure sustained and inclusive development in East Kalimantan.

Through the Indonesia Green Growth Program, with funding from the Government of Norway, GGGI played a pivotal role in facilitating and supporting the design of East Kalimantan's ERP. As a well-established and trusted partner of the government, GGGI helped convene an open dialogue among national, provincial, and local stakeholders, leading to their participation in and acceptance of the program design. Along with other development partners, GGGI provided technical assistance, particularly in the areas of carbon accounting, benefit sharing, gender and social safeguards, forest management planning, and green investment. GGGI also assisted the province to mainstream the ERP into its Medium-Term Development Plan (2018–2023) and budget, a key commitment to implement the necessary actions and policy measures for success of the program. In parallel to and complementing support for the ERP, GGGI provided capacity-building for all 20 forest management units (FMUs) in the province to develop business plans aligned with the goals and opportunities of the ERP, which includes incentives and benefits for FMUs and village communities. GGGI also helped identify investment opportunities and bankable projects for the private sector to realize benefits from sustainable forest management.

The ERP is the biggest program in the FCPF's portfolio and makes East Kalimantan the first province in Indonesia to implement REDD+ in accordance with an integrated jurisdictional approach (click here for the document). Results-based payments from the Carbon Fund will be made if emissions reduction targets are met. This will generate up to USD 110 million in performance-based payments in return for the agreed emission reductions in the forest sector. The total Indonesian government budget support toward implementation of ERP activities will be USD 69.5 million.

*Picture 3. East Kalimantan Forest (Source: GGGI)*

The expected amount of emission reductions under the FCPF program is 86.3 million $tCO_2e$, which is equivalent to a 25% reduction against the reference level or baseline emissions. After deducting buffers including 26% in reversals, the net reduction claimed can be estimated at 61.3 million $tCO_2e$. If the ERP succeeds in reducing emissions up to 61.3 million $tCO_2e$ during 2020–2024, the Carbon Fund will make payments for a verified 22 million $tCO_2e$ at the price of USD 5/ton (or a total of USD 110 million). For generations to come, the program is potentially the seed that could transform East Kalimantan's development path toward sustainable and responsible development.

## Solar PV

Global commitments to combat climate change and achieve universal access to modern energy services are at the heart of GGGI's Energy Strategy. The energy sector plays a key role in the transition to a green growth economic model. This is reflected in the 189 NDCs submitted under the Paris Agreement. All NDCs include actions related to energy and set specific energy-focused targets. The SDGs recognize the role of the energy sector in poverty alleviation, improvements in health and well-being, employment creation, and economic growth. SDG 7 explicitly targets sustainable and affordable access to reliable and modern energy for all.

GGGI's work in the energy sector directly contributes to four of GGGI's six Strategic Outcomes. Energy production and energy use account for around two-thirds of global GHG emissions and is the largest single source of emissions. The energy sector is also a significant contributor to local air pollution. Countries' transition to green models in energy production, storage, and delivery enables the capture of green jobs.

GGGI has been promoting solar PV solutions to expand affordable and sustainable energy services, improve the renewable energy mix, and enhance energy efficiency through the adoption of rooftop solar PV for residential and commercial usage, development of mini-solar grids, and scaling up of existing solar PV systems.[23]

To assess the practical feasibility and the financial viability of a potential solar PV project, the first step is to determine the technical engineering aspects of a potential project. Those aspects and conditions will vary depending on the location of the project, the size of the available area (hectares, ha/acres, $m^2$), the electricity generation capacity (megawatts, MWs), and other issues. The electrical system requirements, especially distribution and transmission infrastructure, will also need to be assessed. The next step is a financial project assessment based on the technical details of the solar PV project. The approximate capital expenditures (especially equipment and land), labor and other operational costs, electricity sales income, and financial performance of the project will be analyzed. These assessments and analyses are prepared using standard financial indicators and benchmarks to determine the profitability and bankability of the project.

The current solar PV portfolio consists of 17 projects across eight countries in four world regions. It adds up to USD 399 million in total climate investment commitments with a total project size of 383+ MWp.

**Table 5. List of solar PV projects, 2015–2020**

| # | Project Name | Country | Project Size (MW) | Commitment (M USD) | Year |
|---|---|---|---|---|---|
| 1 | Solar PV Project on Taveuni Island | Fiji | 1.6 | 3.5 | 2017 |
| 2 | Solar PV Project NTT | Indonesia | 5.0 | 15.0 | 2017 |
| 3 | Solar PV Project Mandalika | Indonesia | 10.0 | 17.5 | 2017 |
| 4 | Solar Irrigation Systems for 150 Farms in Manica Province | Mozambique | N/A | 13.5 | 2018 |
| 5 | Vanuatu Outer Island Solar Powered Pumping System Project | Vanuatu | N/A | 1.8 | 2018 |
| 6 | Distributed Solar PV Program | Guyana | 14.0 | 18.0 | 2018 |
| 7 | Solar PV Project in Ovalau | Fiji | 4.7 | 19.8 | 2019 |
| 8 | Design of Three PV-tied Mini-grid Systems | Guyana | 3.2 | 8.6 | 2019 |
| 9 | Design and Structuring of Solar PV system in Wakenaam Island | Guyana | 0.6 | 2.3 | 2019 |

23 Programmatic Solution no. 9: Solar PV (energy transition access and productive use—solar water pumping, solar PV auctions, rooftop, utility scale plants, storage), see GGGI, *Roadmap to Implement Strategy 2030*. Global Green Growth Institute, Eleventh Meeting of the Management and Program Sub-Committee, May 1, 2020, Seoul, Republic of Korea. MPSC/2020/2.

| | | | | | |
|---|---|---|---|---|---|
| 10 | Solar for Small Off-grid Hotels, 500 kW–1 MW | Fiji | 1.0 | 3.0 | 2019 |
| 11 | Solar Cluster in Tolima | Colombia | 39.6 | 28.0 | 2019 |
| | | | | 12.0 | 2020 |
| 12 | Utility scale 250 MW Ground Mounted Solar PV Project for New Highway Corridor in Maharashtra | India | 248.0 | 145.0 | 2020 |
| 13 | Bataan 50 MW Solar Farm Project | Philippines | 50.0 | 45.0 | 2020 |
| 14 | Greening 400 Telecommunication Towers in Colombia | Colombia | 2.4 | 32.0 | 2020 |
| 15 | Accelerating Solar on Island Resorts Program | Fiji | N/A | 20.0 | 2020 |
| 16 | Supporting Fiji State-owned Enterprise in Accessing Finance to Access Solar Energy | Fiji | 3.0 | 3.6 | 2020 |
| 17 | Greening 114 Telecommunication Towers for Vanuatu – a Fuel Switch Project | Vanuatu | 0.1 | 10.0 | 2020 |
| **Total** | | | **383.0+** | **398.6** | |

GGGI's experience in the solar PV space offers some important general lessons in terms of project pipeline development. First, the initial projects have been an opportunity to gain valuable experiences and learn lessons that facilitate subsequent project development. The projects in the sector were initially of smaller size but have clearly become bigger over time. To illustrate, while three projects worth around USD 36 million in total were completed in 2017, six projects for around USD 256 million[24] were completed in 2020. Second, and related to this point, GGGI has deliberately identified opportunities to bundle small-size solar PV systems in larger portfolios. This approach is illustrated by projects no. 14 and no. 17. In both cases, by bundling a high number of small solar PV systems, it became feasible to replace diesel generators at multiple telecommunication towers in Colombia and Vanuatu. Similarly, the project design in the case of Guyana (project no. 8 is detailed in Chapter 5) enabled the aggregation of several smaller systems as a large solar PV program. GGGI is currently exploring one project that would install solar PV systems on rooftops in industrial parks in Ethiopia as a highly replicable and scalable project model. Several aggregation models in this segment are being explored for other Members too.

### Box 3. Greening the Mumbai-Nagpur Expressway, Utility-Scale 250 MW Solar PV Project, India

The Maharashtra State Road Development Corporation Limited (MSRDC) is an Indian public limited company owned by the Government of Maharashtra. It is responsible for planning, designing, constructing, and managing integrated road development projects in select cities in Maharashtra. MSRDC has been developing the 700 km Mumbai-Nagpur Expressway and is planning industrial development zones in several regions along this new expressway.

In 2018, leveraging GGGI's relationship with MSRDC management, GGGI engaged with MSRDC to assess and advise on greening its upcoming projects. Later in the same year, GGGI formalized the partnership with MSRDC to support the greening of the 700 km large infrastructure project in Maharashtra. MSRDC trusted GGGI as a green growth partner due to the organization's neutrality and astute focus on greening the highway. GGGI's engagement was timely as around the same time the Government of India started to focus on greening the railways operation, but there was no similar focus on greening the roadways. If GGGI had not taken up the project, the road development project and the industrial belt development may have been implemented without the planned renewable energy plant, and a standard conventional electrical supply may have been planned instead of greener sources. GGGI's strong in-country relationship positioned it to deliver on the project and mobilize investment.

24 Seven commitments worth USD 268 million.

One of the key advantages of the project was that MSRDC had the land cleared for the project, and the right-of-way was obtained for development activities. In detailed dialogues with MSRDC, GGGI gathered that the key challenge for such large infrastructure projects for MSRDC was the lack of stable cash flows for the early years of operations. The toll fee collection would only start to stabilize around year five of the operation. Additionally, the MSRDC board was keen to have a future ready highway. Given the advantages, challenges, growth potential with planned industrial clusters, and the aspirations of the MSRDC board, GGGI proposed to evaluate renewable energy options to replace current and all future e-mobility-related use of conventional energy for highway operations while also providing an additional revenue stream by selling excess renewable power to the Maharashtra State Electricity Distribution Company Limited (MSEDCL) as soon as the renewable plant becomes operational.

*Picture 4. The project site in 2021 (Source: GGGI)*

*Picture 5. The project site in 2021 (Source: GGGI)*

GGGI led the preparation of the technical and commercial study, including the land assessment, grid study, environmental and social impacts assessments, and detailed financial modeling that demonstrated a convincing business case for evaluating solar PV options. Through a detailed feasibility analysis and working closely with the landscaping expert, a 250 MW solar PV plant was proposed along the 10 interchanges of the highway. The proposal was also duly accepted by MSEDCL for injection into the nearby electrical grids. Furthermore, following applicable legal considerations, GGGI structured a transaction model proposing to establish a special purpose vehicle (SPV) to manage the financial flow and the contractual arrangements with various stakeholders (see Figure 11).

Through the detailed feasibility assessment, GGGI prepared an information memorandum and a detailed project report, which were used to present the project to several local banks, including the State Bank of India, the Rural Electrification Corporation (REC), and international financiers such as Asia Infrastructure Investment Bank (AIIB). GGGI supported the term sheet negotiation between GGGI and MSRDC to get the best financing terms for the project bankability. The MSRDC vice chairman and managing director presented the project to the MSRDC Board, which has approved to provide up to 30% equity in the project.

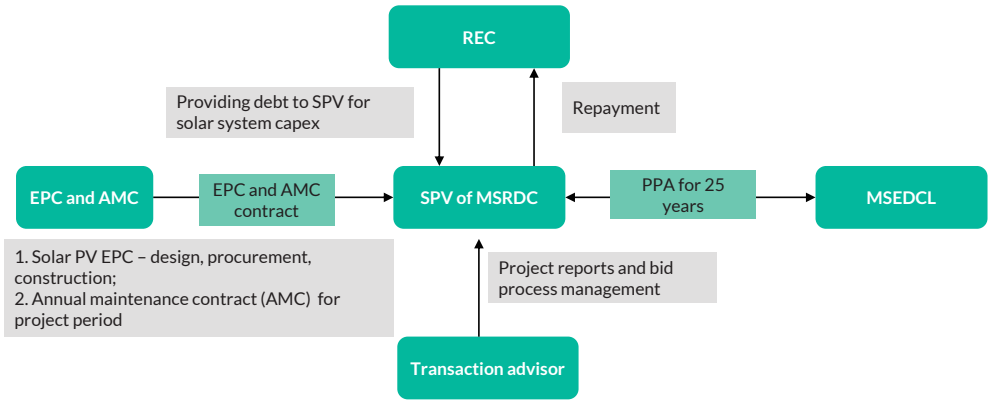



**Figure 11. Financial Structure of the Project**

MSRDC is leading the implementation of this GGGI-designed project, and the MSRDC board has committed USD 40 million in equity. GGGI led the discussion with the REC to secure the USD 110 million loan sanctioned based on the detailed project report and the information memorandum. Additionally, MSRDC has formed an SPV for the solar PV plant, and the Ministry of Corporate Affairs has approved the company. MSEDCL will be the off-taker of the electricity generated by the solar PV project.

The expected longer-term impacts of this project over the 25-year lifetime are a reduction of 10 million $tCO_2e$ and around 200 new green jobs. The project will pave the path for MSRDC's plan for developing charging stations along the highway. GGGI plans to stay involved and partner with MSRDC to further advance the program and support the green transformation. The work was recently highlighted in a video released by the *Financial Times*, showing how cities around the work are tackling climate change, in which the environment minister of Mumbai confirmed the commitment to solarize the Mumbai-Nagpur highway (*For video, click here – interview starts at 4:18).*

## National Financing Vehicles

As mentioned earlier, NFVs, also referred to as green banks or green funds, are essentially funds in countries that are designed to utilize debt and grants to catalyze private capital investment in a pipeline of green climate projects. NFVs play a key role by bridging the gap between financiers and projects. Together with better policies and better projects, NFVs help narrow the climate financing gap by creating the required institutional and financial framework for channeling investment flows into sustainable green growth of Members. The lack of adequate funds and facilities for strategic investment in green climate projects is particularly evident in developing countries, especially in poorer and smaller ones.

The key phases in GGGI's project development (i.e., Concept, Design, and Financing) need to be adapted and modified when developing an NFV. Additional key issues concern strong host government engagement and ownership, a fund management team, governance, and pipeline and origination. NFVs should be tailored to the local market conditions and circumstances to be effective, and an NFV that can blend domestic and international sources of financing is often required. Due to all such tasks, the gestation time for establishment of NFVs is often extensive, and the development and preparation process is complex as well as demanding.

GGGI *Refreshed Strategic Plan 2015–2020* identified the establishment of national funds or facilities that provide strategic investments in green growth of GGGI Members as a key priority for GGGI.[25] Subsequently, GGGI engaged in this area across several Members.[26] In 2016, following a review of 14 Members, Indonesia, Jordan, Mongolia, and Vanuatu were selected for GGGI's program on NFVs, involving the design (or sometimes a re-design) and operationalization of NFVs. This later expanded to eight countries when Senegal, the Philippines, Colombia, and Rwanda were added to the program. However, although GGGI successfully helped establish NFVs in several countries, it also became clear that it was not feasible, practically possible, or even attractive to create an NFV in all cases.

The current portfolio consists of eight NFVs in seven countries across four world regions, adding up to USD 162.1 million in total initial commitments. The NFVs attracted different amounts of capitalization. These first-time funds are moderate size, as expected, and may be scaled up following the completion of the initial fundraising. Frequently, capitalization of NFVs happens in stages and over several years. There are three examples of this in the portfolio.

25 See GGGI, *Refreshed Strategic Plan 2015-2020: Accelerating the Transition to a New Model of Growth* (GGGI, 2017).

26 GGGI, *Discussion Paper on Nationally Determined Contributions (NDCs) and National Financing Vehicles (NFVs)*. Global Green Growth Institute, Fifth Session of the Assembly & Ninth Session of the Council (Joint Session). September 9, 2016, Jeju, Republic of Korea. A/2016/3-C/2016/4.

### Table 6. List of NFVs, 2015–2020

| # | Project Name | Country | Commitment (M USD) | Year |
|---|---|---|---|---|
| 1 | Climate-Resilient Green Economy (CRGE) Facility | Ethiopia | 21.0 | 2015 |
| | | | 68.0 | 2018 |
| 2 | Environmental Bank Foundation-FUNBAM | Costa Rica | 1.0 | 2017 |
| 3 | Vanuatu National Green Energy Fund (NGEF) | Vanuatu | 0.7 | 2017 |
| | | | 0.3 | 2018 |
| | | | 1.1 | 2019 |
| | | | 0.9 | 2020 |
| 4 | Rwanda's Green Fund (FONERWA) | Rwanda | 4.0 | 2018 |
| 5 | Mongolia Green Finance Corporation (MGFC) | Mongolia | 10.0 | 2018 |
| | | | 13.0 | 2019 |
| | | | 26.7 | 2020 |
| 6 | Hungary-Balkan Regional Multi Donor Trust Fund | Hungary-Balkan | 6.0 | 2019 |
| 7 | The Renewable and Energy Efficiency Fund (REEF) | Senegal | 5.0 | 2019 |
| 8 | Green Incubator & Accelerator Facility | Rwanda | 4.4 | 2019 |
| **Total** | | | **162.1** | |

GGGI recently reviewed its experience in designing and operationalizing NFVs.[27] Some of the main lessons and recommendations concern the importance of strong host government commitment, including domestic financial contributions; an NFV must be the right response to addressing the climate finance gap in the country; strong links with the private sector are necessary; and capacity and funding are required for the development of strong project pipelines.

The MGFC is the first GGGI-initiated NFV to be fully capitalized. The funding provided by the GCF in November 2020 supplements funding from the Government of Mongolia (GoM) and all privately-owned banks in Mongolia (see Textbox 4).

### Box 4. Mongolia Green Finance Corporation, Mongolia

MGFC is a new joint public-private sector effort to create an NFV to overcome existing challenges in accessing affordable financing needed for low-emitting technologies in Mongolia. The MGFC specifically aims to provide green, affordable, and gender-inclusive financing for households and businesses to enable them to switch to low-carbon technologies, to improve the policy environment, and to build the capacity and awareness of stakeholders. MGFC aims to become a critical instrument for effective and strategic financing of climate change mitigation policies and measures, thus supporting the GoM to achieve its NDC GHG emissions reduction targets and the National Green Development Policy (NGDP). MGFC reached its initial USD 50 million capitalization target in November 2020, due to funding provided by the GoM (USD 18 million), domestic private banks (USD 5 million), and the GCF (USD 27 million).

Building on the support on green growth action plan development for Mongolia's NGDP during 2013–2015, GGGI initiated discussions with the GoM and the Mongolian Bankers Association (MBA) on establishing an NFV for Mongolia. Accordingly, GGGI was closely engaged from the initial concept to the development of the MGFC GCF proposal in 2020. Initial work started in 2015 by developing a selection methodology for a potential financial institution to be scaled up as an NFV in Mongolia. Energy and housing sector assessments exploring potential energy efficiency solutions for households, SMEs, and large industries were provided by GGGI. In addition, a legal assessment and an NFV feasibility study were completed, and GGGI prepared a conceptual business plan that created the blueprint for a detailed business plan and the GCF proposal.

27 GGGI Technical Report No. 9, *Review of GGGI's Experience to Design and Operationalize National Financing Vehicles to Finance Climate and Green Growth Policy Implementation* (GGGI: December 2019).

Following the completion of a GCF Readiness program in 2018, GGGI and the GCF reached out to XacBank—the GCF Accredited Entity (AE) in Mongolia—for preparation of a GCF funding proposal. As part of the funding proposal preparation, the international consulting group Green Investment Group (GIG) was engaged to strengthen the governance structure and to ensure operational readiness. To officially formalize the MGFC stakeholders, the MGFC Steering Committee was established with representatives from ministries, the MBA, the AE, and, as a non-voting member, GGGI.

Significant co-financing was one of the main requirements of the GCF for an acceptable funding proposal, and GGGI was tasked by the MGFC Steering Committee to secure co-investors. GGGI approached several international financial institutions, including ADB, the European Investment Bank, Netherlands Development Finance, and AIIB, and supported XacBank by organizing mission visits by the GCF, GIG, and AIIB to meet with public and private counterparties. The lack of track record—as the MGFC was not yet established—was one of the main challenges in securing co-investors. Despite the lack of credit history, AIIB expressed interest in financing MGFC, but the GoM decided to become a co-financier on the basis that it would be the most suitable co-financier at the pre-establishment stage. During the development of the funding proposal, GGGI ensured a smooth handover of MGFC to XacBank. GGGI also provided support to the MGFC Steering Committee and the AE in the areas of pipeline development and stakeholder engagement.

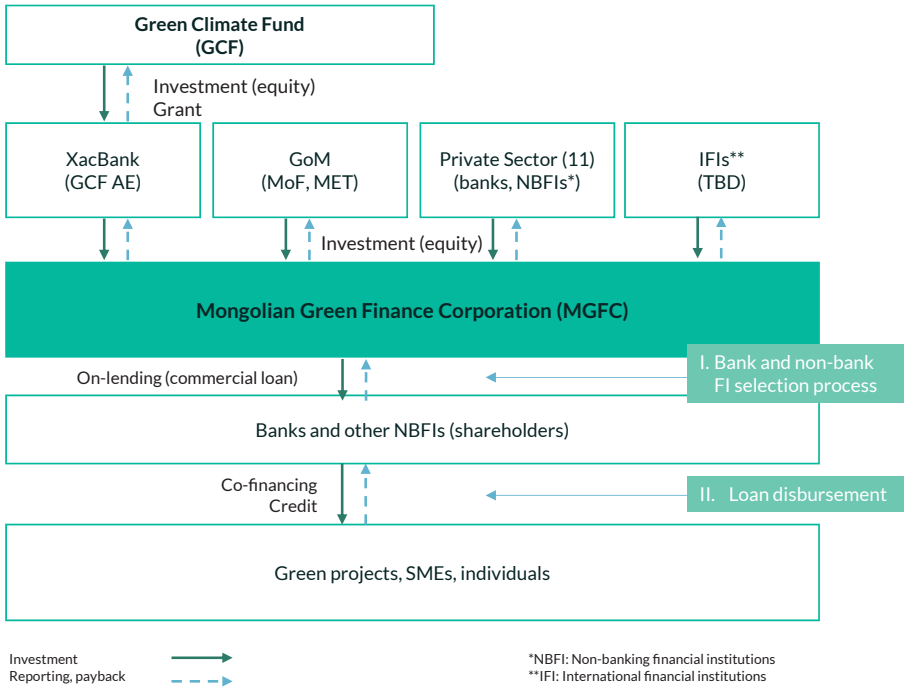



**Figure 12. MGFC Operational Structure**

Reaching agreement on the capital structure required a considerable amount of careful engagement and communication with the shareholders as the design of MGFC was unfamiliar both to the GCF and Mongolia. After postponing the submission of the funding proposal several times, GCF approved the MGFC funding proposal in November 2020. Overall, it took more than five years for MGFC to advance from concept to establishment. The MGFC secretariat noted that "GGGI played an instrumental role in bringing MGFC to the finishing line."

When placing the public-to-private involvement in NFVs on a spectrum with pure public as the starting point and pure private as the end point, MGFC would lie at the right side. This is because of strong private sector involvement but still enough inclusion of the government, through the Steering Committee and the capital structure, to ensure that national climate goals are the priority of the fund rather than commercial returns. MGFC demonstrates that international climate finance can leverage the private sector. In short, MGFC is a "triple first": it is the first fully capitalized NFV developed by GGGI, the first green bank funded by the GCF, and finally the first PPP initiative in the financial sector in Mongolia. GGGI expects to continue supporting MGFC, including during the operationalization phases.

## Waste Management

GGGI's thematic approach to green cities supports an integrated and cross-sectoral approach and responds to local, national, and global needs and commitments, through its four priority areas: 1) mainstreaming green growth into urban planning and management; 2) resource efficient and low carbon cities; 3) solid waste management: managing waste as a resource; and 4) decentralized sanitation and wastewater solutions.[28] Over the years, GGGI's project financing around the theme has been developed to cope with waste crisis, one of the most common and pending challenges cities face globally.

Waste management is principally a local government responsibility, but local governments rarely have the funding or capacity available to develop the systems and infrastructure required. The rate of waste generation will more than double over the next twenty years in lower income countries alone. Unsustainably managed waste through unregulated dumps or open burning has immense negative environmental consequences and severe impacts on the health, safety, and quality of life of residents in developing countries. It also proves to be a massive financial and resource burden on local governments.

GGGI's project preparation approach in tackling waste management is to more effectively valorize the waste streams and construct viable business models by converting waste to valuable resources and leveraging PPPs in the waste sector. Cities increasingly realize that deriving value (including lessening costs) from waste management is a high priority, as waste management accounts for a high proportion of budgets. Materials recovery, valorization/value capture, reducing costs of collection, and others are all sought by municipal authorities; however, most authorities in developing countries have limited expertise beyond business-as-usual approaches, including limited experience in working with private or informal actors and investors. GGGI has advised several government agencies to develop contractual PPP models and technical specifications for waste solutions to achieve greener, pro-poor applications.

The current portfolio consists of five municipal solid waste (MSW) projects across five countries in three world regions and adds up to USD 88.4 million in total investment commitments.

**Table 7. List of MSW projects, 2015–2020**

| # | Project Name | Country | Project Size (Installed capacity /day) | Commitment (M USD) | Year |
|---|---|---|---|---|---|
| 1 | Rice Husk Waste to Energy Projects for 3 Rice Mills | Senegal | 0.63 MW | 1.7 | 2018 |
| 2 | Vientiane's Solid/Water Waste Management | Lao PDR | N/A | 2.3 | 2019 |
| 3 | Palm Oil Waste to Energy in Meta | Colombia | 8.3 MW | 20.8 | 2019 |
| 4 | First Advanced Municipal Solid Waste to Energy Project | Viet Nam | 10 MW 500 tons | 28.0 | 2019 |
| | | | | 29.5 | 2020 |
| 5 | Digestate Plant, Cali (Biogas and digestate from Cali vegetable markets) | Colombia | 0.65 MW 50 tons | 6.1 | 2020 |
| | **Total** | | **19.58+ MW 550+ tons** | **88.4** | |

In Viet Nam, GGGI supported Thang Long Energy Environment JSC, a private enterprise, to develop a municipal solid waste-to-energy (MSWTE) project in the Bac Ninh province and has successfully helped mobilize USD 58 million in senior debt financing and equity for this project. In Thailand, in partnership with Udon Thani City Municipality, GGGI is working to establish a systematic e-waste management system and

28 Programmatic Solution no. 6: Waste Management (circular economies, urban and agricultural waste, wastewater, FSM, waste to resource), see GGGI, *Roadmap to Implement Strategy 2030*. Global Green Growth Institute, Eleventh Meeting of the Management and Program Sub-Committee, May 1, 2020, Seoul, Republic of Korea. MPSC/2020/2.

scalable material recycling center. A pilot e-waste treatment plant that can intake up to 500 kg of waste per day is being evaluated. Preliminary analysis of the project suggests that breakeven can be achieved by processing high-grade e-waste greater than 100 tons per year.

### Box 5. First Advanced Municipal Solid Waste-to-Energy Project, Viet Nam

GGGI was primarily tasked with the role of financial advisor to complete project financing for the construction of the MSWTE power plant. This first-of-its-kind 10 MWe plant will process 500 tons of waste daily. Most of the collected solid waste in the secondary city is currently disposed of in open landfills. The landfills pose several significant problems. Methane and carbon dioxide are released into the air. Seepage from landfills also creates serious threats to the environment around them, especially to the ground water system. In addition, energy generated from waste diverted from the landfill will reduce reliance on coal-fired power in Viet Nam.

*Picture 6. Waste in Bac Ninh (Source: The Natural Waste in Bac Ninh Resources and Environment Newspaper)*

In 2020, GGGI obtained the initial investment commitments for the project by arranging blended project debt with development finance institutions (DFIs) and a commercial bank in Viet Nam. The financial structure is 37.5% equity and 62.5% debt.

The project activities were conducted in a close partnership with the Energy and Environment Partnership Program with the Mekong Region (EEPM), a development program sponsored by the Ministry of Foreign Affairs, Finland, and the Nordic Development Fund (NDF). GGGI teamed up with EEPM to assess and identify a project developer that required technical support for project risk mitigation and finance. More specifically, the GGGI team analyzed and further developed the business and financial model, designed the capital structure, including blending of financial instruments, and recommended risk mitigation options and de-risking possibilities. Finally, GGGI would negotiate the initial investments by preparing an information memorandum, facilitate an investor longlist and arrange investor meetings, open data rooms, and conduct site visits and investor roadshows.

*Picture 7. The initial construction at the project site at the end of 2020 (Source: GGGI)*

The partnership with EEPM was one of the key success factors as it made it possible to leverage EEPM's strong project pipeline, enabling GGGI to further develop environmentally and socially sustainable and still financially feasible project models as well as approach the right pioneer investors to obtain their interest. One of GGGI's key strengths was to help mobilize blended debt finance. The blended concessional finance made high-risk, non-recourse project debt finance more attractive for the local commercial bank partner.

The project is expected to operate during its 20-year lifetime to enhance environmental protection in the Bac Ninh province by adopting the best available technology in the waste treatment process and by improving people's living conditions through better waste management. In Viet Nam, the potential for scalability of the project model is up to 20 modern MSWTE plants in secondary cities with an estimated capital expenditure of USD 1 billion. This model can be scaled up through a climate finance facility or a fund that would provide a systematic risk mitigation and benefits sharing mechanism for interested private sector companies and financial intermediaries. The structure requires a standardized type of project model that could be replicated by many firms.

## Sustainable Mobility

Sustainable transport has been a focus area for GGGI since its inception. Sustainable transport and e-mobility align with GGGI's objectives of scaling up existing electric mobility initiatives, including delivering policy advice to in-country projects and programs, conducting sector assessments, assessing technology options where relevant, identifying and conceptualizing sustainable project models, and leading the content side of knowledge-sharing programs. GGGI has also expanded its scope toward forms of travel that do not rely on an engine or motor for movement, such as walking and bicycling. GGGI's work related to cleaner fuels, public transportation, and walkability has aimed at reducing dangerous concentrations of air pollutants and specifically links transport policy with air quality ($SO_2$) and related positive health outcomes.[29] GGGI has supported cities and regions in creating more connected, accessible cities while addressing the challenges of transportation and mobility.

To date, GGGI has actively supported partnerships and country e-mobility implementation with more than 13 Members. Specifically, feasibility studies on the introduction of electric buses were completed in Jordan, Nepal, Lao PDR, Fiji, and India. Policy recommendations and/or project preparatory studies that support e-mobility and public and sustainable transport were developed in cooperation with governments in Mexico, Morocco, Ethiopia, Cambodia, Mongolia, Rwanda, and Myanmar. Examples include recommendations on technical standards for electric vehicles in Lao PDR and low-emission development strategies (LEDS) for land transport in Fiji.

Governments of GGGI Members have a key role to play in financing and supporting sustainable transportation. Multilateral development banks (MDBs) and climate finance are important additional sources of financing that can be leveraged by national governments. However, national governments and MDBs alone will not be able to meet the needs in the transportation sector. Governments can attract private sector financing by ensuring a viable regulatory and legal environment, proper design and structure of markets, and long-term incentives for private investment. Appropriately structured PPPs may be a useful and efficient way for engaging the private sector in the transportation sector.[30] Other ways to engage the private sector may be necessary as well.[31]

The current portfolio consists of six Sustainable Mobility projects across four countries in the Asia and Africa regions. It amounts to USD 79.6 million in total initial commitments. The e-mobility program in Nepal illustrates the activities and support provided by GGGI in this sector.

**Table 8. List of sustainable mobility projects, 2015–2020**

| # | Project Name | Country | Project Size | Commitment (M USD) | Year |
|---|---|---|---|---|---|
| 1 | Electric Buses in the State of Himachal Pradesh (under GGGI-TERI project) | India | 25 E-buses | 5.0 | 2015 |
| 2 | Bangalore Metropolitan Transport Cooperation | India | 150 E-buses | 30.0 | 2017 |
| 3 | Electric Trikes for Palawan's Climate Resilient Green Growth | Philippines | 100 E-trikes | 0.9 | 2019 |
| 4 | Electric Mobility Program, Phase II | Nepal | 260 E-buses | 26.0 | 2019 |
| 5 | Green Investment Advisory Support – Public Bicycle Sharing (PBS) Scheme | Rwanda | N/A | 0.9 | 2019 |
| 6 | Low Carbon Buses for the Bus Rapid Transit System in Vientiane | Lao PDR | 96 E-buses | 16.8 | 2020 |
| **Total** | | | **631+ vehicles** | **79.6** | |

29 Programmatic Solution no. 7. Sustainable Mobility (e-mobility, non-motorized transport), see GGGI, *Roadmap to Implement Strategy 2030*. Global Green Growth Institute, Eleventh Meeting of the Management and Program Sub-Committee, May 1, 2020, Seoul, Republic of Korea. MPSC/2020/2.

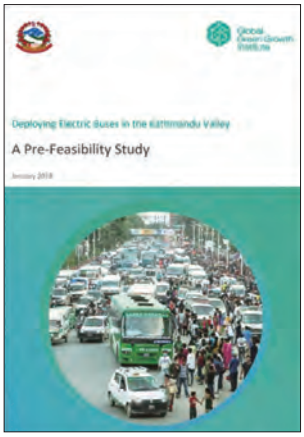
30 Michael Klein, *Public-Private Partnerships: Promise and Hype*. World Bank Group Policy Research Working Paper, No. 7340, June 2015.

31 J. Delmon, *Private Sector Investment in Infrastructure* (Alphen an den Rijn: Wolters Kluwer, 2016).

## Box 6. E-mobility Program, Nepal

In 2019, the Government of Nepal (GoN) mobilized an investment of USD 26 million (NPR 300 crore) from the national budget for the procurement of electric buses and charging stations for operation by the public transport bus operator, Sajha Yatayat. Until that point, Sajha Yatayat's fleet of 58 buses were entirely diesel. This investment was the first direct capital investment from the government into electric buses and constituted a major switch from diesel, which had until then been the norm. It came following two years of sustained technical advisory on electric mobility from GGGI to the GoN's Ministry of Forests and Environment, Ministry of Transport and Infrastructure, and Sajha Yatayat, all of which are partners of GGGI in Nepal and lead recipients of the Electric Mobility Program, implemented in collaboration with the government.

*Picture 8. Cover page of the pre-feasibility study, published in 2018 (Source: GGGI)*




Specifically, GGGI technical advisory support began with a pre-feasibility study on deploying electric buses within Sajha Yatayat's operations in Kathmandu Valley. This was conducted in 2017–2018 and provided an understanding of the landscape for electric mobility in Nepal. At the same time, the deployment of electric buses for public transport was integrated into a new National Action Plan for Electric Mobility, developed with the Ministry of Transport and Physical Infrastructure. These activities capitalized on the experience and knowledge shared with the India Country Program, which in 2015–2017 had assessed the technology, policy, social, and environmental benefits of deploying electric buses in Bangalore, India.

During 2019, GGGI deepened its partnership with Sajha Yatayat and undertook an expanded feasibility study and investment proposal, which included both technical engineering and financial analysis relevant for the deployment of 50 electric buses in Kathmandu within Sajha Yatayat's fleet. A technical options analysis focused on scoping destinations, routes, and stops at the provincial and metropolitan levels for new electric buses; scoping and assessing grid viability for the installation of charging stations and advising on appropriate locations; and assessing and recommending on vehicle and charging station specifications. The financial analysis suggested a business model for electric buses, including revenue, across nominated routes. GGGI also advised Sajha Yatayat on other operational aspects to ensure a successful deployment of the nominated fleet, using local financing for capital expenditure. To ensure that GGGI's intervention included considerations of wider social issues, battery reuse options were explored to minimize e-waste from an increased presence of electric buses. Gender equality and social inclusion options were also reviewed in the investment proposal. The goal of the study and proposal was to structure a clear, inclusive, replicable, and scalable business model while also mobilizing the funding needed from national sources for the deployment of electric buses for public transport.

*Picture 9. Cover page of the technical & financial analysis, published in 2020 (Source: GGGI)*


These technical and financial analyses supported the GoN's decision to invest USD 26 million in electric buses in 2019. Sajha Yatayat is a cooperative, effectively owned by several federal and local government bodies, and it is the only operational, publicly owned transport operator in Nepal. All government investment into Sajha Yatayat until 2019 had been for the procurement of diesel buses. The federal government's decision to shift to electric and begin the steady process of electrifying Sajha Yatayat's bus fleet was therefore a significant change. With the investment of USD 26 million, the federal government greatly expanded its shareholding of Sajha Yatayat and is expected to allow the operator to procure approximately 250 electric buses during a five-year period and deploy these through staggered stages across all seven provinces of Nepal. Procurement of the first installment of buses is ongoing, with GGGI providing technical support.

The project will result in the provision of pro-poor gender-sensitive electric mobility transportation in Kathmandu and nationally and will also lead to significant GHG emission reductions. Electric mobility aligns with the GoN's broader energy security and trade concerns. As part of this, GGGI has also supported the Ministry of Forests and Environment to integrate and expand its targets for electric mobility through Nepal's

second enhanced NDC. In addition, GGGI has continued to deepen and extend its partnerships with the GoN though the design and development of a concrete, inclusive, feasible, and replicable strategy for provincial transport electrification and knowledge exchange.

## Cross-Cutting

While the projects in the Cross-Cutting segment are more diverse, they fall mostly in the green cities space as illustrated by the Green City Pilot Project in Rwanda. GGGI's support to the preparation of a subnational green bond in Sonora is also included in this segment as this bond was intended to raise finance for the green growth strategy for Sonora, including for the capital city of Hermosillo. Other projects are concerned with energy efficiency in SMEs. There were no new commitments made in 2020 because of increased emphasis on other thematic areas.

The current portfolio consists of 10 projects across five countries (and one region) in the Asia, Africa, Latin America, and Pacific regions. It amounts to USD 126.9 million in total investment commitments.

**Table 9. List of projects bundled under cross-cutting, 2015–2020**

| # | Project Name | Country | Commitment (M USD) | Year |
|---|---|---|---|---|
| 1 | Green Growth Priorities Identified for Indonesia (under GGGI-TERI project) | Indonesia | 5.0 | 2015 |
| 2 | Green City Pilot Project | Rwanda | 60.0 | 2017 |
| 3 | First SME-only National Energy Efficiency Program for Replacing Lighting, Motors and Variable Speed Drives | Thailand | 20.0 | 2018 |
| 4 | Energy Efficiency Projects in the SME Sector | Thailand | 1.2 | 2018 |
| 5 | Ulaanbaatar City Thermo-technical Retrofitting of Residential Buildings | Mongolia | 4.8 | 2018 |
| | | | 7.2 | 2019 |
| 6 | Ulaanbaatar City Constructuion of a Green Kindergarten | Mongolia | 0.6 | 2018 |
| | | | 0.3 | 2019 |
| 7 | Sonora State Green Bond to Implement the Sonora Green Growth Strategy and Finance the First Stage of BRT Development | Mexico | 25.0 | 2018 |
| 8 | Implementation of the Regional NDC Hub | Pacific Regional | 2.5 | 2018 |
| 9 | Green Infrastructure Planning and Delivery | Rwanda | 0.1 | 2019 |
| 10 | Inclusive Green Urban Development | Rwanda | 0.3 | 2019 |
| **Total** | | | **126.9** | |

## Conclusions

From 2015 to 2020, GGGI developed 59 green investment projects that reached initial investment commitments. The entire portfolio of commitments sums to USD 2.1 billion, against the GGGI target of USD 600 million. Regarding commitment volume, the five major sub-portfolios were Sustainable Forests, Solar PV, NFVs, Waste Management, and Sustainable Mobility. Because GGGI has been involved in some sectors considerably longer than others, the five thematic sectors differed greatly in terms of investment volume, as pointed out in Chapter 3.

The significance of these sectors was discussed in terms of government objectives, climate mitigation, employment, and economic growth. The chapter identified GGGI's value-add and the state of play in the sectors. It was also noted that the level and type of engagement by the private and public sectors vary by sector. Being privatized and unbundled more than the other sectors, energy is the most mature and ripe sector for private investor engagement. The Sustainable Forests space is much less feasible and viable from the perspective of purely private investors.[32] Services in the Waste Management space have traditionally been the responsibility of national or local governments, which have drawn on public budgets for financing. More recently, it has been possible for private companies to engage and create business models that deliver services in this sector, but a blend of public and private financing is typically needed.

The second difference among the sectors concerns the types of financial products and financial instruments that are commonly available to investors. A broad range of financial products and instruments is being utilized in the Solar PV space and in the energy sector more broadly, whereas fewer financial instruments and products are available across Sustainable Forests, Waste Management, and Sustainable Mobility. GGGI expects that new financial products and instruments, such as green bonds and climate bonds, could become more common in those sectors in the short term. This development seems already to be underway.[33] Finally, NFVs are, under certain circumstances, impactful strategic investment solutions that connect green projects and climate finance, but their establishment can be complex, lengthy, and expensive.

32 To date, most conservation finance has come from philanthropic and public finance. See GGGI, *Bridging the Policy and Investment Gap for Payment for Ecosystem Services* (GGGI: 2016). See also, for example, Credit Suisse, WWF, and McKinsey & Company, "Conservation Finance: Moving Beyond Donor Funding Toward an Investor-Driven Approach," p. 10. January 2014; *Forum for the Future and EnviroMarket, "Forest Backed Bonds: Proof of Concept Study."* August 2007.

33 See GGGI, *Green Bonds Make More Cents? International Experiences and Policy Implications for Viet Nam* (GGGI: June 2021). See for instance, CBI, *Green Infrastructure Investment Opportunities: Viet Nam 2019 Report* (CBI: 2019)

# FINANCIAL INSTRUMENTS FOR GGGI'S GREEN INVESTMENT PROJECTS

# 5

There is a strong need to increase the flows of investment into green infrastructure, manufacturing, agriculture, and forest conservation in developing countries. UNCTAD estimates an annual financial gap of USD 2.5 trillion between the funding that is currently available and what is required to meet the UN SDGs by 2030.[34]

The lack of clear and strong actionable pipelines in developing countries and emerging markets mirrors the risks and issues that characterize these countries and markets. For example, all else the same, investors are attracted to countries with stable and predictable political and regulatory environments and are discouraged by countries with unpredictable and unfavorable policies and regulations.[35] The WB's *Doing Business 2020* concludes that only two Sub-Saharan African economies rank in the top 50 on the ease of doing business; no Latin American economies rank in this group.[36]

As noted in Chapter 2, it is often necessary to mitigate and de-risk green investment projects—by risk transfer, partial or full elimination of risk, or both—to be able to attract the required investment. GGGI helps structure projects such that they will meet the risk tolerance and financial return expectations of investors. As mentioned already, GGGI classifies into five categories the key risks to be considered in project preparation: political risk, regulatory risk, technology risk, credit risk, and capital market risk. These risks are furthermore interrelated to some extent.

GGGI aims to mobilize the amounts and types of financing that are needed to create a financially viable and sustainable structure for a project, an NFV, or a thematic bond. The most relevant financial instruments are debt, private equity, guarantees, and grants. These financial instruments need to be combined in a manner that creates a balanced capital structure that will meet the objectives and expectations of financiers and investors.

34 See Convergence, *The State of Blended Finance 2020*. UNCTAD, *World Investment Report: Investing in the SDGs: An Action Plan*. (UNCTAD, 2014).

35 See also Ranjit Lamech and Kazim Saeed, *What International Investors Look for When Investing in Developing Countries: Results from a Survey of International Investors in the Power Sector* (Washington, DC: World Bank Group, 2003).

36 World Bank, *Doing Business 2020*. See www.doingbusiness.org/en/doingbusiness.

As Figure 13 shows, GGGI mobilized both public sector funding and commercial capital during 2015–2020. Public funding contributed USD 1.2 billion in total while commercial finance contributed USD 851 million. As noted in Chapter 3, Sustainable Forests was the dominant sector in the early years, but several sectors that were added later attracted significant amounts of commercial capital. As shown in Figure 13, following one large private sector project in 2017, the amount of annual commercial capital committed grew consistently since 2018.

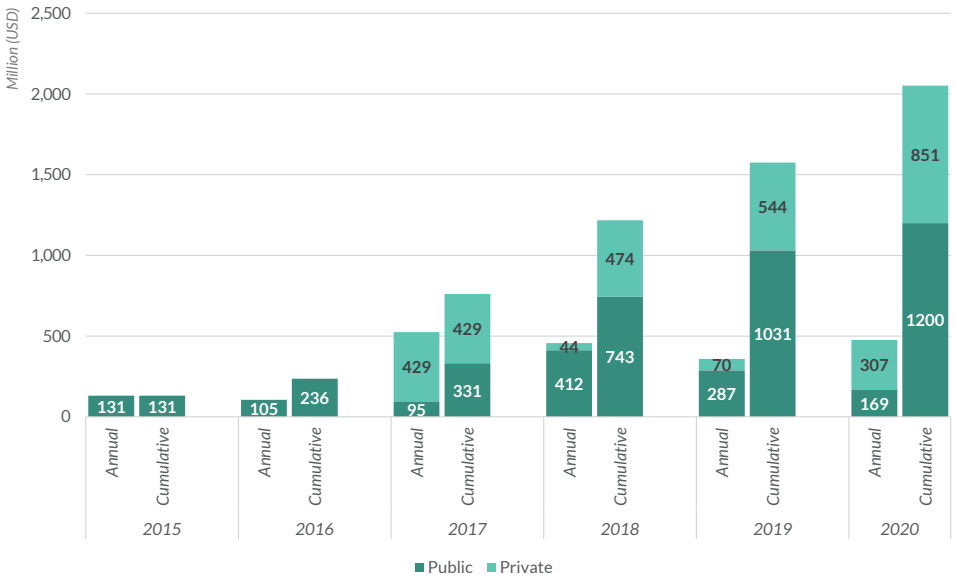



**Figure 13. Public and private sector cumulative investment commitments, 2015–2020**

It is instructive to look more carefully at these two fundamentally different sources of financing. Considering public funding overall, USD 669 million (55%) in RBF and USD 358 million in grants (30%) were the biggest public sector contributions. Local, bilateral, and multilateral public sources provided this funding. Debt and equity contributed much smaller shares (14%) of the total mobilization. Regarding private capital, debt (49%) and equity (49%) each contribute significantly to the overall mobilization volume. One private sector grant accounted for the balance (2%). Figure 14 shows the proportion of instruments deployed by public investors, while Figure 15 shows the proportion of instruments deployed by private investors.

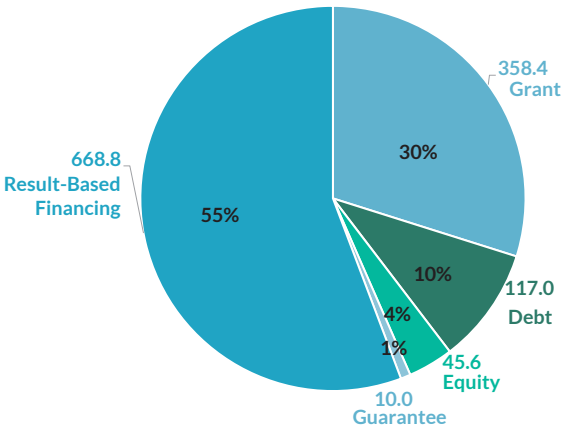



**Figure 14. Instruments deployed by public investors, 2015–2020 (million USD)**

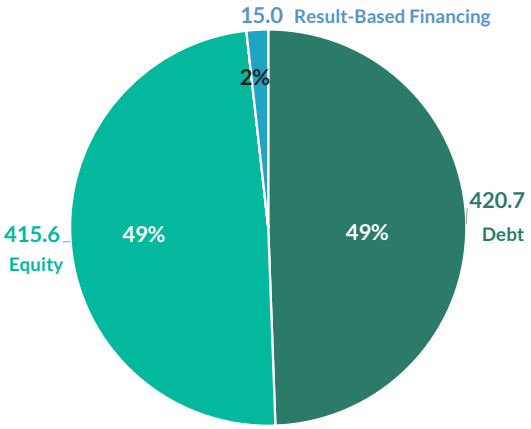



**Figure 15. Instruments deployed by private investors, 2015–2020 (million USD)**

The amounts of funding and types of instruments by thematic area should also be considered (Table 10). As noted earlier, Sustainable Forests projects were supported by large performance grants, international RBF schemes, and public grants. The seven projects in the portfolio would not have been financed without public funding support. Just one private sector grant structured as a performance grant was mobilized—in fact, one of just two financial commitments made by the private sector—to support Sustainable Forests. As pointed out earlier, there is a lack of viable, replicable, and scalable business models in this space. Development of such business models will likely require policy and regulatory reform.

**Table 10. Funding amounts and instruments by thematic area, 2015–2020 (million USD)**

| Public/Private | Type of Instruments | Sustainable Landscape | | Solar | | Fund (NFV) | | Waste | | E-mobility | | Others | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Public | Grant | 165 | 14% | 26 | 7% | 109 | 67% | 2 | 3% | 36 | 45% | 20 | 16% |
| | Debt | 2 | 0% | 14 | 3% | 38 | 23% | 22 | 25% | 17 | 21% | 25 | 20% |
| | Equity | 0 | 0% | 9 | 2% | 10 | 6% | 0 | 0% | 26 | 33% | 1 | 1% |
| | Guarantee | 0 | 0% | 0 | 0% | 0 | 0% | 10 | 11% | 0 | 0% | 0 | 0% |
| | Result-based financing | 669 | 56% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% |
| Sub-totals (Public) | | 836 | 70% | 49 | 12% | 157 | 97% | 34 | 38% | 79 | 99% | 46 | 37% |
| Private | Grant | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% |
| | Debt | 27 | 17% | 157 | 39% | 0 | 0% | 8 | 9% | 0 | 0% | 49 | 38% |
| | Equity | 138 | 12% | 193 | 48% | 5 | 3% | 46 | 52% | 1 | 1% | 32 | 26% |
| | Guarantee | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% |
| | Result-based financing | 15 | 1% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% |
| Sub-totals (Private) | | 360 | 30% | 350 | 88% | 5 | 3% | 54 | 62% | 1 | 1% | 81 | 63% |
| Total per Theme | | 1196 | | 399 | | 162 | | 88 | | 80 | | 127 | |
| Grand Total | | | | | | | | | | | | 2,051 | |

**Note: The private debt and equity under Sustainable Landscape is from a single project, Mekele City Water Project (2017).*

Funding for solar energy was first and foremost provided by private investors (88%), which is expected given the maturity of the technology. The investor track record in the solar energy sector thus created a clear contrast to the Sustainable Forests sector. The private sector commitments were made almost equally in terms of equity (55%) and debt (45%). Public grants, loans, and equity amounted to only around 12% of the total mobilization. Development agencies provided grants only in the case of least developed countries (LDCs) and Small Island Developing Countries (SIDS) (i.e., not for middle-income countries).

Aside from the MGFC, funding for NFVs came exclusively from local and international public sources. Grants were the preferred instrument among public funders; debt was offered in just a few cases. In the case of the MGFC, the GoM and the GCF both provided debt and equity, and private sector banks participated with a matching equity contribution (see Box 4).

The experience from the Waste Management sector was quite different. Some companies in the waste-to-energy space mobilized financing for revenue-generating projects without requiring public funding. Still, DFIs provided public concessional funding in the form of debt and guarantees to catalyze private investment into pioneering projects, which for the first time introduced a waste-to-energy technology into a country (confer Box 5). Very limited use of public grants was observed in this sector. The only example was in the case of LDCs, more specifically Lao PDR.

Apart from one minor private sector equity commitment, Sustainable Mobility was supported solely by public funding. Funding came both from local sources and regional development banks. Public funds to purchase e-buses or to invest in local public transportation companies were provided in the form of grants (45%), equity (33%), or loans (21%).

Finally, as previously noted, the Cross-Cutting segment was more diverse, but projects were mostly in the green cities space or concerned with energy efficiency in SMEs or buildings. Funding was provided both by public (37%) and private investors (63%). The biggest commitments in this sector were made by private investors. Investors were mostly local; however, some were international.

The significance of concessional funding is evident from this review of the mobilized investment commitments.[37] Given the differences among the prioritized sectors, it is also evident that the availability and importance of concessional finance varies significantly across GGGI priority sectors.

37 Concessional finance is financing at below market rates and terms (or with maturity, grace period, security, or rank offered on soft terms without being priced according to the market). See DFI Working Group on Blended Concessional Finance for Private Sector Projects. Joint Report, October 2018 Update, p. 23. IFC, *Using Blended Concessional Finance to Invest in Challenging Markets: Economic Considerations, Transparency, Governance, and Lessons of Experience* (Washington DC: IFC, 2021), p. 5 and pp. 14-15

# 6 INVESTORS AND SPONSORS OF GREEN INVESTMENT PROJECTS

The funding for the green investment projects that GGGI prepared in the 2015–2020 period came from a broad range of public and private sources. This indicates a considerable interest in and appetite for supporting green projects in the GGGI thematic areas. It is also evident that the types of investors and sponsors that were engaged differed significantly across thematic areas. This is due to the very different nature, development, and maturity of the sectors. In this way, it showed which types of financial instruments are typical and characteristic at various points in the sector and market transformation.

As noted in Chapter 5, public funding accounted for USD 1.2 billion of the total mobilization amount, and private sector funding accounted for USD 851 million. Now, which types of investors accounted for these commitments? Table 11 shows the various sources of funds that supported the projects in the GGGI global portfolio. On the public sector side, funding came from local government budgets, development agencies, DFIs, multi-donor or multilateral climate funds, MDBs, global carbon funds, local NFVs, and local banks. In short, a very diverse group of investors. On the private sector side, the main sources of funding were firms, companies, and corporates. Local commercial banks and impact investors accounted for fewer commitments.

**Table 11. Sponsors and investors in green investment projects, 2015–2020 (million USD)**

| Type of Investors | Total | Results-based financing | Debt | Equity | Grant | Guarantee |
|---|---|---|---|---|---|---|
| Private company/business | 629.3 | 0 | 274.8 | 354.4 | 0 | 0 |
| Development agency | 524 | 430 | 0 | 0 | 94 | 0 |
| International climate fund | 229.1 | 103.8 | 23.9 | 4.7 | 96.7 | 0 |
| Local government | 211.1 | 0 | 38 | 40.9 | 132.2 | 0 |
| Local state-owned company | 186.1 | 0 | 133.1 | 52.9 | 0 | 0 |
| Global carbon fund | 110 | 110 | 0 | 0 | 0 | 0 |
| Development financial institution | 57 | 25 | 22 | 0 | 0 | 10 |
| National financing vehicle | 39.5 | 0 | 5 | 0 | 34.5 | 0 |
| Multilateral development bank | 26.3 | 0 | 25.4 | 0 | 0.9 | 0 |
| Impact investor | 23 | 15 | 4.8 | 3.2 | 0 | 0 |
| Local private bank | 13 | 0 | 8 | 5 | 0 | 0 |
| Local public bank | 2.7 | 0 | 2.7 | 0 | 0 | 0 |
| **Total** | **2051** | **683.8** | **537.7** | **461.1** | **358.4** | **10** |

Commercial investors accounted for the biggest overall commitment amount (31%). Most private investors were local, a few invested in countries within their region, and one was an international investor. Their commitments were made in the form of equity (56%) or, to a lesser extent, in the form of debt (44%). Impact investors and local private banks committed only small amounts—each just around 1% of the total mobilization.

Development agencies were the second biggest source of funding (26%). They committed sizable performance grants (RBF) to projects to be implemented as bilateral initiatives for several GGGI Members. Development agencies also provided straight grants.

DFIs provided concessional finance to blended finance structures in a couple of projects.[38] Together, this indicates a potentially considerable role for bilateral and multilateral concessional finance in financing green investment projects. Concessional finance generally serves to increase return (i.e., lower the cost of capital, revenue subsidy) and/or de-risk projects. Both uses improve the risk-return profile on a project.

International climate funds (i.e., the GCF and the Adaptation Fund) also provided a significant proportion of funding in the form of RBF, debt, grants, and, in the case of one project, equity (11%). One prominent global carbon fund, the FCPF, committed a considerable portion of the total mobilization (5%).

Local governments provided around 10% of the total commitment. Their commitments were made in the form of grants (63%), equity (19%), and debt (18%). Local state-owned companies accounted for around 9% of the total commitment. Their commitments were made in the form of debt (72%) and equity (28%). Local green funds provided around 2% of the total commitment. These commitments were mostly grants (87%), and a smaller portion was debt (13%). Finally, local commercial banks provided around 1% of the total commitment. They committed primarily debt (62%) but also equity (38%).

It is instructive, finally, to note which recipient or beneficiary groups of countries were selected for the instruments made available by international public investors. Development agencies, MDBs, and international climate funds earmarked their grant commitments almost entirely for LDCs and SIDS (98%). The only exceptions were small grant commitments provided in the case of Mongolia and the Philippines. Regarding the utilization of non-grant instruments (i.e., debt, equity, and guarantees) DFIs and international climate funds first and foremost made commitments in the case of non-LDCs (94%) but rarely selected those instruments in the case of LDCs or SIDS, except in the case of Fiji (6%).[39] MDBs made debt commitments only to SIDS and LDCs.[40] Performance grants or RBF were selected for a small group of low-income and upper middle-income countries that were a good fit for such programs.

38 Definition of blended concessional finance by DFI: "Combining concessional finance from donors or third parties alongside DFIs' normal own-account finance and/or commercial finance from other investors, to develop private sector markets, address the Sustainable Development Goals and mobilize private resources." See DFI Working Group on Blended Concessional Finance for Private Sector Projects – Summary Report, October 2017, p. 3.

39 Based on many transactions, there seems to be a consistent, clear tendency that most blended finance transactions have mobilized funding for middle-income countries. See Convergence, The State of Blended Finance 2020.

40 MDBs lend regularly to middle-income countries.

# 7 GREEN INVESTMENT PROJECTS UNDER IMPLEMENTATION

The lack of a strong actionable pipeline of green investment projects in developing countries reflects the risks and issues that characterize these countries and the current limited capacity to structure innovative impactful green projects. It should be kept in mind that GGGI exits the project when investors and funders have made the initial investment commitments and agree to fully develop and finance a green investment project that GGGI helped in the challenging initial project development phases.

What happens to GGGI-initiated projects after initial project preparation has been completed? Do they move forward after GGGI exits the project? An external evaluation carried out in 2019 that reviewed a subset of projects concluded that the majority of GGGI-initiated green investment projects move forward from the concept stage to the financing and implementation stages. These results are very encouraging (Box 7).

**Box 7. Evaluation of GGGI's Green Investment Services**

The *Evaluation of the Global Green Growth Institute's (GGGI) Green Investment Services*, prepared together with Finergreen Asia Pte. Ltd., reviewed 26 investment projects and confirmed that the majority of GGGI-initiated green investment projects are moving forward to financing and implementation.

- Only 0.1% of the total value has been dropped.
- Two thirds (or USD 357 million) of the total investment commitments of USD 539 million evaluated have advanced to signed investment agreements or the disbursement stage.
- The private sector has committed to raise USD 391 million (73%) of the total investments.

GGGI Main Report, *Evaluation of GGGI's Green Investment Services* (GGGI: December 2019)

This chapter will provide three examples of green investment projects currently in the implementation and operational phase, which GGGI helped to prepare and match with investors. These post-financial close projects are being implemented in the Solar PV, Sustainable Forests, and E-Mobility sectors in the Philippines, Rwanda, and Guyana, respectively. They offer concrete, vivid examples that GGGI helps its Members making the transition to a low-carbon, resilient world of strong, inclusive, and sustainable growth by bringing projects through the upstream project preparation phase.

## Electric Trikes for Climate-Resilient Green Growth in Palawan, Philippines

Tricycles running on fossil fuels account for more than two-thirds of all carbon dioxide emissions emitted by the transportation sector in the Philippines. The transition to sustainable mobility will require carefully phased approaches as well as developing enabling policy conditions, coordinating technology transfer, setting up charging infrastructure, and managing stakeholders that could be adversely affected.

*Picture 10. Deployment of the e-tricycles (Source: GGGI)*

GGGI's first approach to e-mobility in the Philippines was to demonstrate electric tricycle operations by providing technical assistance, including a detailed e-tricycle deployment plan and facilitation of a grant deal financed by the ADB through the Department of Energy. This USD 0.9 million grant allowed the San Vicente and Brooke's Point municipalities, located in the Province of Palawan, to receive 50 e-trikes each.
The project introduces a limited number of e-trikes with a low environmental impact, but it has considerable long-term significance as a pilot to demonstrate the viability of low-carbon technology on the ground. A significant upscaling potential is available by expansion to popular tourist spots with strong transportation demand. The adoption of e-trikes also benefits the local economy by reducing the demand for and consumption of petroleum imports. The e-trikes will reduce the fuel cost for e-trike drivers by up to USD 4 per day and provide job creation through the establishment of manufacturing companies and associated after-sales services.

*Picture 11. Deployment of the tricycles (Source: GGGI)*

*Picture 12. Launch of the e-tricycles (Source: GGGI)*

## Strengthening Climate Resilience of Rural Communities in Northern Rwanda

Northern Province, Gicumbi district is considered the province most exposed to climate hazards and with the second-highest sensitivity to climate-related impacts in Rwanda. The high dependency on rainfed agriculture, the hilly topography, the low access to climate information, and the depletion of forest stocks are the major factors exacerbating its vulnerability to such hazards.

Strengthening Climate Resilience of Rural Communities in Northern Rwanda—in short, the Gicumbi Project—was designed mainly as an adaptation project to reduce vulnerability to climate change by enhancing the adaptive capacity of the targeted groups as well as reducing their exposure to climate risks. GGGI's intervention focused on the design of the overall project structure and provided support to the Ministry of Environment in preparation of the GCF Funding Proposal. The funding amount of USD 33 million was approved by the GCF Board in 2018.

*Picture 13. Implementation of the project (Source: FONERWA)*

The Gicumbi Project aims to increase the resilience of vulnerable communities to climate change in nine subdivisions in Gicumbi, comprising 252 villages and 63% of the district's population. The project includes

activities to restore and enhance ecosystem services of watershed areas, increase the capacity of communities to renew and sustainably manage forest resources, and support smallholders to adopt climate-resilient agriculture. The project will also invest in green settlements for vulnerable families currently living in high-risk areas. A total of 320,000 individuals are expected to benefit directly from the project, and approximately 6,300 individuals will be trained for or provided with green job opportunities. Project implementation began in October 2019 and has successfully achieved the targets set for the planned activities despite challenges due to the COVID-19 pandemic.

## Design of Three PV-tied Mini-Grid Systems, Guyana

*Picture 14. Implementation of the project (Source: FONERWA)*

*Picture 15. Implementation of the project (Source: FONERWA)*

Power generation in Guyana has historically been close to 100% dependent on fossil fuels. In its first NDC, submitted in 2015, Guyana committed to eliminating its dependence on fossil fuels and to developing a diversified energy mix targeted at a 100% renewable power supply by 2025 if adequate and timely funding was provided.

As part of this support, GGGI has been providing technical support to the government for development of various solar PV projects under the Urban Sector Solar Energy Program. In 2019, GGGI prepared technical tender documents for three PV-diesel hybrid systems in Bartica (1.5 MW), Lethem (1 MW), and Mahdia (0.65 MW), totaling 3.15 MW. They were financed with a USD 8.6 million concessional loan from the Inter-American Development Bank, executed by Guyana Energy Agency. The project sites are in the Hinterland without access to the electricity grid, resulting in unreliable access to energy.

*Picture 16. The project site in Mahdia, Guyana (Source: GGGI)*

The installed solar PV systems will partially displace the use of fossil fuels for electricity generation and will reduce approximately 3,147 $tCO_2e$ annually. The PV systems will also improve the reliability and extend the availability of the power supply for longer periods of the day during the rainy season and reduce the cost of electricity production by up to USD 0.15 per kWh. The PV technology at utility scale, introduced in this component, represents an innovative solution to satisfy a concrete need in the three townships. The implementation of these three projects will increase the share of electricity generated by solar PV in the three townships from 0% to 27%. As of Q1 2021, two of the three sites, Bartica and Lethem, have completed the procurement process with the engineering, procurement, and construction contractor who carried out the geotechnical survey on the sites. GGGI will remain engaged in the project and guide the government in expanding solar project implementation to additional sites.

*Picture 17. Geotechnical survey happening in Lethem in Feb. 2021 (Source: GGGI)*

# 8 LOOKING AHEAD

Since 2015, GGGI has mobilized over USD 2.1 billion in initial green climate investment commitments. This mobilization volume signals a sharp increase over the results of the previous period. GGGI aims to sustain the mobilization increase in the next organizational growth phase in line with the strategic direction and investment mobilization ambitions.[41]

GGGI initially focused on the areas of sustainable forests, smaller renewables and clean energy projects, NFVs, and more recently on waste management and sustainable mobility. GGGI has prepared pre-feasibility studies, market assessments, and in some cases legal analyses; organized stakeholder and government consultations, seminars or workshops, and awareness-raising events; and mobilized investors and funders to make initial investment commitments.

GGGI's preparatory work on projects is conducted in line with GGGI's vision and strategy and focuses on addressing the sizeable gap between identifying and developing workable financial mechanisms for green projects and mobilizing finance for green investment in developing countries. The work conducted during 2015–2020 is aligned with GGGI's thematic areas and matches the needs and priorities of each Member as outlined in the Country Planning Frameworks and Country Business Plans (CBPs).

GGGI offers a comprehensive set of services to its Members based on the value chain approach (see Chapter 2). However, green projects in the development space often are not bankable and do not match the risk-reward ratio of investors. To respond to this challenge, GGGI's project preparation strives to identify and construct viable and replicable business models designed for maximum impact and to work together with Member governments for regulatory reform, where needed, and other parties for their ultimate participation.

## Commitment Mobilization

Going forward, the origination and project preparation efforts will be widened and deepened across GGGI to accelerate the flow of investible green investment projects. The projections made by country teams amount to USD 1.9 billion in total green investment commitment mobilization in 2021–2022.[42] This figure is derived from the 71 green investment projects included in the CBPs and exceeds the total GGGI investment amount projected in *Strategy 2030*.

41 GGGI has developed three scenarios for annual investment mobilization growth by 2030, ranging from USD 1.4 billion to USD 2.8 billion, with USD 2 billion as a so-called Optimum Scenario. See GGGI, *GGGI Strategy 2030* (GGGI, 2019), p. 30-31.

42 The final mobilization volume is expected to be lower than these figures due to unforeseen risks (e.g., the COVID-19 pandemic) that will influence GGGI's origination efforts and investment decisions. The total investment mobilization amount projected in *Strategy 2030* is USD 1.5 billion in 2021–2022

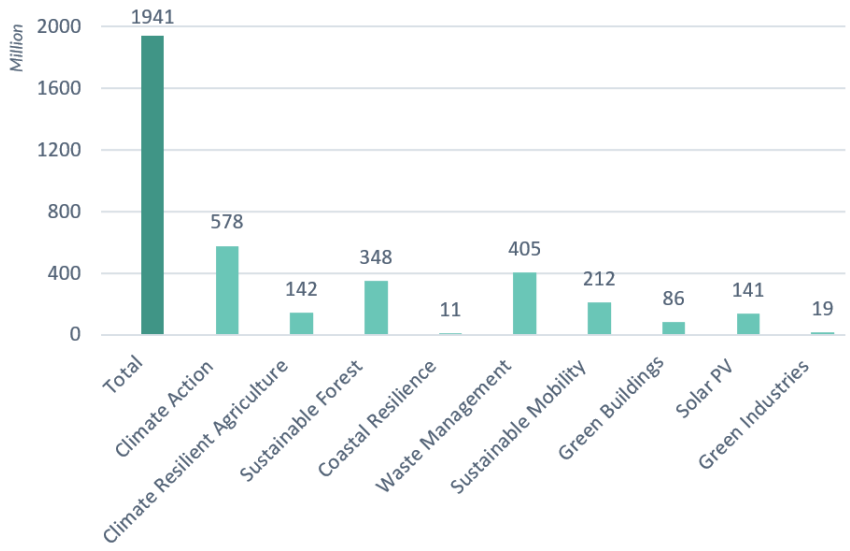



**Figure 16. Green investment ambition 2021–2022 per programmatic solution (million USD)**

*Source: GGGI, Work Program and Budget 2021–2022 (GGGI: October 2020).*

The CBPs show continued focus on Sustainable Forests, Solar PV, and Sustainable Mobility, and considerable growth is expected especially in Waste Management and Climate Resilient Agriculture.[43] A more limited number of Green Industries and Coastal Resilience projects are being planned as well.

Although solar PV projects still face challenges in developing countries, GGGI has successfully prepared and delivered around 20 projects that utilize solar PV technologies. The competitive low equipment cost, the modular nature, and the maturity of the technology make these projects comparatively straightforward from the perspective of project development and financing.[44] As mentioned already, these characteristic aspects have also made this segment useful from the view of building GGGI's project preparation capacity in the initial phase. At the same time, GGGI has not confined itself to renewables. This is demonstrated by the SME energy efficiency program GGGI developed together with the Provincial Electricity Authority and Energy Efficiency Services Limited (EESL) in 2019. GGGI will develop new opportunities and test promising business models as clean energy technologies become mainstream investments.[45]

## Concessional Finance and Blended Concessional Finance

As noted earlier, the GGGI portfolio initially included many straight grants and performance grants. This choice of instruments reflected that the targeted projects in the forest conservation and land-use sectors did not have strong commercialization potential in the short and medium term. The importance of accessing and utilizing concessional finance to catalyze commercial finance became more pronounced when GGGI began to focus on sectors with commercial potential. GGGI began to structure projects to bring in concessional finance that could leverage commercial investment in sectors that were not fully commercial. Two broad approaches to mobilization are therefore important.

As one key mobilization approach, GGGI should keep governments fully aware and familiar with green climate technologies. GGGI should continue to add value through capacity building and government awareness raising and preparation of technical and economic feasibility assessments. Policy advice to facilitate the

43 The Programmatic Solution no. 9 Solar PV includes energy storage. GGGI expects the utility side to increasingly become an integrated part of future clean electric mobility solutions

44 See, for example, ISA, *Ease of Doing Solar 2020 in ISA Member Countries* (ISA, 2021). For existing challenges in financing solar power generation assets in developing countries, see Common Risk Mitigation Mechanism, "Feasibility Study." November 2017

45 GGGI is currently exploring several wind energy projects. Wind energy shares some of the same characteristics as solar energy.

introduction of technologies will be important to open markets. Technology improvements and innovation must be structured into actual projects, and there will be an increasing need to design and structure public sector projects appropriately so that new green technologies are well-integrated into project design. GGGI should select technologies that are government priorities and are investible and feasible given available public budgets and international funds. Greening of large-scale infrastructure projects is an area where GGGI recently added considerable value. This was illustrated in the highway solarization project in the Indian state of Maharashtra and in the public transportation project in Lao PDR.

The second approach is more directed toward the private sector. Bankability will be essential to engage commercial capital. GGGI's value-add will be to help origination and upstream structuring of private sector projects so that they can meet the return expectations and risk tolerance of investors. Matching of investors and projects will be key, and GGGI should help identify concessional finance instruments that can "crowd-in" commercial capital, including local financial institutions, by strengthening the commercial viability of green projects and utilizing appropriate de-risking strategies.[46] The opportunity for concessional finance will depend on the commercial viability and maturity of green technologies and sectors. As noted in this report, the solar energy sector is more commercially viable than the water sector and sustainable land-use projects.[47] GGGI must structure projects in ways that will create real opportunity for blended concessional finance to mobilize commercial capital. In this manner, the two approaches are mutually supportive. The role of concessional finance to mobilize private capital will be particularly important for LDCs and SIDS, which are already experiencing widening financial gaps to achieve the SDGs and are the hardest hit by the COVID-19 crisis.[48]

## Replication and Upscaling

Upscaling, aggregation, and programmatic approaches are important models and mechanisms to increase the financial flows required for the green transformation of Members.[49] This is reflected in the GGGI *Work Program and Budget 2021–2022*.[50] GGGI will continue developing viable business models that can bundle and scale smaller projects into larger portfolios. Several examples of promising business models were given in Chapter 4. Bundling of smaller projects with the aim to reduce transactions costs and increase the overall ticket size is important to attract investors looking for larger-scale assets. Larger investors are unable to invest in small projects, and smaller investors may also decide not to engage because of issues due to deal size limitations. Replication and upscaling of proven market-tested technologies and commercially viable business models across strategic thematic areas will remain a priority in the next phase. Priority should be given to the development of standardized simplified approaches and structures instead of more bespoke and customized structures requiring a relatively high development cost, particularly for small-size projects.

In parallel, and to further develop and broaden the GGGI pipeline, innovative project and program designs will be key to support and strengthen emerging technologies and support new business models. Several initiatives are already under development. For instance, GGGI is currently designing several new projects to roll out climate-smart solar irrigation programs in five countries in the Africa region.[51] GGGI is also partnering with the International Solar Alliance (ISA) as part of the deepening engagement in this solar PV segment. In

46 Several examples from the Southeast Asia region are mentioned in ADB, *ASEAN Catalytic Green Finance Facility 2019-2020* (ADB, January 2021).

47 In emerging markets, prices cover 30% of the costs of water on average and some 80% of costs of electricity. This means that private investment will not flow into power and water projects without availability of subsidies. See Michael Klein, *Public-Private Partnerships: Promise and Hype*. World Bank Group Policy Research Working Paper, No. 7340, June 2015.

48 OECD/UNCDF (2020), *Blended Finance in the Least Developed Countries 2020: Supporting a Resilient COVID-19 Recovery*, OECD Publishing, Paris.

49 Scaling, bundling, and aggregation as a priority area is discussed in the GIS internal note, *Thematic Diagnostics: Green Investment Services*. Revised June 28, 2018.

50 GGGI, *Work Program and Budget 2021-2022* (GGGI: October 2020), p. 16-17.

51 The program covers Burkina Faso, Ethiopia, Mozambique, Senegal, and Uganda. For Senegal, see GGGI, *Landscape Analysis Report to Scale up the Installation of Solar Irrigation Businesses in Senegal* (GGGI, January 2021). Generally, see GGGI, *Compendium of Practices in Climate Smart Agriculture and Solar Irrigation* (GGGI: March 2021).

parallel, GGGI is designing a multi-country program to explore opportunities for biomass-derived fuels, also referred to as Bio-CNG, in three countries in the Asia region.[52] GGGI is the main implementing partner for the Climate Finance Access Network for Pacific Small Island Developing States, supporting the first eight countries.[53] GGGI is in the process of deploying green investment advisors, who will be specifically trained to develop project pipelines to unlock climate finance, in order to provide a prompt and practical solution to the climate finance bottleneck in the region.[54] As a learning organization, GGGI will utilize the experiences and lessons gained in the start-up years to innovate new, promising green interventions in the next phase. GGGI will strike the balance between consolidation of existing green business models and innovation of new business models able to mobilize green investments.

## Greening the Financial Sector

Since 2018, GGGI has been increasingly engaged in supporting greening of the financial sector of Members This work is directed toward two priority areas. The first is concerned with the development of the road map and framework for green bonds and thematic bonds in emerging markets.[55] Regional development banks are increasingly involved in this area, and several thematic bonds, sector bonds, and cross-cutting bonds currently exist, which could raise significant amounts of financing from private, institutional, and commercial funds.[56] The first GGGI engagement in this area supported one of the states in Mexico in building institutional capacity to undertake pre-issuance steps, including green bond framework development and prioritization of eligible green projects. GGGI is currently supporting the development of new green bond issues in Viet Nam as well as supporting the issuance of the first sustainable sovereign bond in Peru; scoping activities are also ongoing in the Dominican Republic, Saint Lucia, and Mexico. The second emerging priority area is greening of NDBs. GGGI is increasingly focusing on NDBs in emerging markets by supporting them in integrating environmental, social, and governance standards into their investment eligibility criteria and due diligence processes. This engagement—initially developed in response to requests for support from leading agricultural banks in Colombia and now active in Mexico, Colombia, and Peru—is a significant step toward greening the domestic financial sector of Members.

## Carbon Pricing

Since 2020, GGGI has been supporting Members in accessing carbon finance and in setting a price for carbon transactions, usually expressed as a value per $tCO_2e$. The precursors to this work are the two projects in Indonesia described in Chapter 4, which will offer more than USD 280 million in RBP from the FCPF and the GCF. Carbon finance is included as a key mechanism in the Paris Agreement and could potentially mobilize significant amounts of capital needed to meet its objectives and implement the NDCs under the agreement. GGGI will continue to expand its work on international carbon transactions under Article 6 of the Paris Agreement, including development and implementation of pilot transactions that contribute to the operationalization of the new mechanisms under Article 6. GGGI will also provide technical assistance required for Members to develop and implement carbon transactions.

52 The program covers India, Indonesia, and Thailand.

53 The initial countries are Fiji, Kiribati, Papua New Guinea, Samoa, the Solomon Islands, Tonga, Tuvalu, and Vanuatu.

54 Climate Finance Access Network - RMI

55 The most important are climate, green, sustainability, social, and transition bonds. See GGGI, *Green Bonds Make More Cents? International Experiences and Policy Implications for Viet Nam* (GGGI: June 2021)

56 See, for instance, ADB, *Green, Sustainability, and Social Bonds for COVID-19 Recovery: A Thematic Bonds Primer* (ADB: February 2021). For IADB, see "Connecting and Developing Markets." *Environmental Finance*, 22 February 2021. For the West African Development Bank (BOAD), see "The West African Development Bank (BOAD) issues the first African sustainability bond." https://www.BOAD.en/the-west-african-development-bank-boad-issues-the-first-african-sustainability-bond. January 21, 2021.

## Climate Adaptation

Around USD 193 million was mobilized for the funding of adaptation and climate resilience projects over 2015–2020, and GGGI will build on this track record in the next phase. Although adaptation tends to be overshadowed by the attention paid to climate mitigation, there are significant benefits from taking action. The Global Commission on Adaptation estimated that investing USD 1.8 trillion globally in a range of adaptation approaches from 2020 to 2030 could generate USD 7.1 trillion in total net benefits.[57] GGGI-initiated projects will be climate proofed, for example, by ensuring that solar irrigation projects adopt a climate-smart design. In general, projects should be explicitly designed or modified to adapt to climatic variability and extremes. Agriculture, sanitation, and the water sector are likely to be impacted by climate change; cross-cutting sectoral impacts should also be mitigated. Additionally, climate risks should be integrated as part of the due diligence and lending approval process at domestic banks of Members.

## Partnerships

GGGI will continue to prioritize developing and deepening partnerships with strategic investors, financial institutions, and platforms with a deep understanding of and a long-term commitment to green growth in developing countries and emerging markets. The group of key partners consists of development agencies, DFIs, multi-donor climate funds, MDBs, and local public and financial institutions. GGGI will continue its efforts to design innovative financial mechanisms that can mobilize private capital needed for green investment projects. Building on its experience with preparation of green investment projects and NFVs, GGGI will continue to partner with MDBs and DFIs to use concessional finance to leverage commercial investment at scale and to originate investible green projects that attract commercial capital. As an example of such innovative partnerships, GGGI has partnered with the ADB to provide knowledge and awareness of green finance and to support origination and structuring of projects for the ACGF, which provides ASEAN member governments with technical assistance and access to over USD 1 billion in loans from co-financing partners.[58] Also, since 2018 staff from GGGI and AIIB have regularly reviewed promising green climate concepts and projects and explored opportunities to accelerate the development of a strong pipeline of green infrastructure projects. Finally, partnering with leading national and international scientific, technical, and knowledge organizations will also remain important in creating a supportive financial ecosystem and building a supply chain for projects that will accelerate mobilization of climate finance for GGGI Members.

57 Global Commission on Adaptation, *Adapt Now: A Global Call for Leadership on Climate Resilience* (Global Center on Adaptation and World Resources Institute, 2019), p. 3.

58 Overview: ASEAN Catalytic Green Finance Facility (ACGF) | Asian Development Bank (adb.org)

# 9 CONCLUSIONS AND RECOMMENDATIONS

Today, there is a shortage of investable and bankable green projects in developing countries and a strong need to match projects and finance. To address this gap between projects and financing, GGGI decided in 2014 to expand its original focus on policy advice to include the preparation of green investment projects. Projects, NFVs, and financial instruments were the priority investment areas. This decision marks a decisive move to the right side of the GGGI value chain. As detailed in this report, GGGI mobilized around USD 2.1 billion in initial investment commitments for a total of 59 green climate projects in the period 2015–2020. The private sector contributed 41% of the total mobilization amount.

Chapter 2 outlined GGGI's phased approach to project preparation, which is divided into Concept, Design, and Financing. GGGI has focused on addressing the key issues and fundamentals in project preparation upstream: development of a robust project concept; assessment of technical and financial feasibility; social, economic, and environmental assessment; and bankability and investability screening and analysis. Moreover, GGGI structures projects so that they meet investor requirements with respect to investment size, risks, and appropriate returns. GGGI exits a project when the proven initial investment commitments needed to finance the project have been made by private and/or public investors.

Chapter 3 presented an overview of the global portfolio of projects developed by GGGI during 2015–2020. In 2018–2020, 16–21 projects were prepared annually for an approximate value of USD 430 million. The portfolio focused initially on Sustainable Forests projects and small renewables projects. NFVs, Waste Management, and E-Mobility were added later. Chapter 3 also reviewed the number of projects and mobilization amounts across regions. It was noted that the different median project sizes across the regions— Latin America (USD 19.4 million), Asia (USD 16.8 million), Africa (USD 7.5 million), and the Pacific (USD 3.5 million)—reflected the different nature of the regions and their portfolios.

Chapter 4 reviewed the global portfolio from a thematic perspective. It distinguished six sub-portfolios—Sustainable Forests, Solar PV, NFVs, Waste Management, E-mobility, and Cross-Cutting—and included the project names, host country, size of investment commitment, and year of commitment for each sub-portfolio. Moreover, five projects were presented in more detail to describe the steps and actions that GGGI staff regularly undertook during project preparation. These projects were the East Kalimantan Emission Reductions Program in Indonesia, the Mumbai-Nagpur solarization project in Maharashtra in India, the MGFC, the First Advanced Municipal Solid Waste to Energy Project in Viet Nam, and the E-Mobility Program in Nepal.

Chapter 5 reviewed the instruments that were utilized to finance green investment projects and the types of funding by thematic area. RBF and grants were invested in sustainable landscapes projects; private investors committed debt and equity to Solar PV projects, and a smaller proportion of public grants and debt were committed; NFVs were mostly supported by public grants and debt; Waste Management was supported

by public debt and private equity, and waste-to-energy projects were supported by equity; public debt and equity were committed to E-Mobility projects; and Cross-Cutting projects were supported both by public debt and grants and by private debt and equity. Clearly, funding came from both public and private sources. RBF and grants were the main instruments used by public investors—they committed only limited amounts of debt and equity. In contrast, aside from philanthropic investors, private investors committed only debt and equity.

Chapter 6 reviewed the broad range of investors that were committed to financing green investment projects. 12 different types of investors were identified; some were local, others global; some were public, others private. The chapter also identified the instruments that were preferred by different types of investors. Private companies made the biggest total investment commitment, followed by development agencies. International climate funds, local governments, local state-owned companies, and global climate funds came next in size of commitments. They were followed by DFIs, NFVs, MDBs, impact investors, and local private banks and local public banks.

Chapter 7 noted that the majority of GGGI-initiated projects moved forward to financing and implementation after GGGI's exit. It presented three examples of projects that have moved to the implementation phase. These projects illustrated the impacts of GGGI's engagement across different world regions and thematic areas, namely e-mobility in the Philippines, climate resiliency in Rwanda, and energy access in Guyana.

Chapter 8 discussed the prospects for the next phase of climate finance mobilization and development of green project pipelines. The report made recommendations for increasing the mobilization volume in line with GGGI's *Strategy 2030*. Six specific mobilization strategies were outlined, which are summarized as follows:

*Blended Finance*: Public funding has been a key source of finance, especially for projects that are commercially unviable. GGGI's experience confirms that access to concessional finance from public sources is normally necessary to unlock private sector capital. Green investment projects in developing countries are often characterized by risks and uncertainty, and "de-risking" and credit enhancement techniques are needed to engage commercial capital. There is a strong need for effective blended concessional finance structures to bridge the large climate financing gap between projects and finance.

*Replication and Upscaling*: Aggregation and programmatic approaches are significant models to increase the flows of climate funding. GGGI has already helped develop several projects that bundle smaller renewables and energy efficiency technologies to reduce transaction costs and increase the overall ticket size. In the same vein, GGGI should pursue multi-country programs as a cost-effective approach to scaling emerging technologies and pioneering new business models.

*Greening the Financial Sector*: GGGI should continue its work on the development of road maps and frameworks for green bonds and thematic bonds more generally in emerging markets. This will include strengthening institutional capacity to perform pre-issuance steps and meeting reporting and disclosure requirements. Another emerging priority is greening of NDBs. GGGI should continue to focus on the integration of environmental, social, and governance standards into investment eligibility criteria and due diligence processes.

*Carbon Pricing*: Since 2020, GGGI has been supporting Members in setting a price for carbon transactions

and in accessing carbon finance. Carbon finance is one of the key financial mechanisms in the Paris Agreement and could potentially mobilize large volumes of private capital needed for meeting its targets and finance the implementation of the NDCs under this Agreement.

*Climate Adaptation*: GGGI is already working on climate-smart agriculture projects and will continue to ensure that all projects comply with relevant internal safeguard policies and procedures and are designed or modified as necessary to adapt to climatic variability and climate extremes. Over 2015–2020, GGGI helped mobilize around USD 210 million for the financing of adaptation and climate resilience projects of Members.

*Partnerships*: GGGI should prioritize developing and deepening partnerships with strategic investors, financial institutions, and platforms with a deep understanding of and a long-term commitment to green growth in developing countries and emerging markets.

Lastly, the report includes two annexes. Annex 1 provides a complete list of the 59 green climate projects developed by GGGI from 2015 to 2020, and Annex 2 presents the project summaries. More information follows below.

# METHODOLOGY AND DATA

Early-stage and initial investment commitments were received and recorded by GGGI in the form of verified investor-signed letters of intent, memorandums of understanding, term sheets, and letters of appreciation, among others. See Chapter 2.

Commercial investment commitments that did not identify specific financial instruments in the initial investment commitment documentations (LoIs, MoUs, etc.) were counted as 60% debt commitment and 40% equity commitment.

Commitments of local government budgets were considered as grants. One example of this is the co-contribution of the Government of Indonesia (GoI) to the East Kalimantan Emission Reductions Program in Indonesia.

State-owned companies operating at an arm's length of government and on a commercial basis were considered private sector companies. One example is REC in India.

Financial commitments made by local funds (NFVs) that were capitalized by development agencies, global climate funds, or MDBs were considered local public funding.

# ANNEX 1. LIST OF GREEN INVESTMENT PROJECTS, 2015–2020

This list includes all green investment projects and investment commitments made during 2015–2020. All values are in million USD.

| # | Project Name | Country | Commitment (USD M) | Year |
|---|---|---|---|---|
| 1 | Electric Buses in the State of Himachal Pradesh (under GGGI-TERI project) | India | 5.0 | 2015 |
| 2 | Green Growth Priorities Identified for Indonesia (under GGGI-TERI project) | Indonesia | 5.0 | 2015 |
| 3 | Amazon Vision Program REDD+ | Colombia | 100.0 | 2015 |
| | | | 25.0 | 2016 |
| 4 | Norway REDD+ Implementation through Partnership | Ethiopia | 80.0 | 2016 |
| 5 | Environmental Bank Foundation-FUNBAM | Costa Rica | 1.0 | 2017 |
| 6 | Support for Rural Communities' Drought Resilience | Ethiopia | 10.0 | 2017 |
| 7 | GCF Irrigation Systems Support | Ethiopia | 50.0 | 2017 |
| 8 | Mekele City Water Project | Ethiopia | 337.0 | 2017 |
| 9 | Solar PV Project on Taveuni Island | Fiji | 3.5 | 2017 |
| 10 | Bangalore Metropolitan Transport Cooperation | India | 30.0 | 2017 |
| 11 | Solar PV Project NTT | Indonesia | 15.0 | 2017 |
| 12 | Solar PV Project Mandalika | Indonesia | 17.5 | 2017 |
| 13 | Vanuatu National Green Energy Fund (NGEF) | Vanuatu | 0.7 | 2017 |
| | | | 0.3 | 2018 |
| | | | 1.1 | 2019 |
| | | | 0.9 | 2020 |
| 14 | Green City Pilot Project | Rwanda | 60.0 | 2017 |
| 15 | Strengthening Climate Resilience of Rural Communities in Northern Rwanda (SCRNRP) | Rwanda | 33.0 | 2018 |
| 16 | Rwanda's Green Fund (FONERWA) | Rwanda | 4.0 | 2018 |
| 17 | Development of Eco-tourism Park in Kigali – Wetland, Nyangungu | Rwanda | 1.7 | 2018 |
| 18 | Rice Husk Waste to Energy Projects for 3 Rice Mills | Senegal | 1.7 | 2018 |
| 19 | Solar Irrigation Systems for 150 Farms in Manica Province | Mozambique | 13.5 | 2018 |
| 20 | Climate-Resilient Green Economy (CRGE) Facility | Ethiopia | 21.0 | 2015 |
| | | | 68.0 | 2018 |
| 21 | First SME-only National Energy Efficiency Program for Replacing Lighting, Motors and Variable Speed Drives | Thailand | 20.0 | 2018 |
| 22 | Energy Efficiency Projects in the SME Sector | Thailand | 1.2 | 2018 |
| 23 | Vanuatu Outer Island Solar Powered Pumping System Project | Vanuatu | 1.8 | 2018 |
| 24 | Ulaanbaatar City Thermo-technical Retrofitting of Residential Buildings | Mongolia | 4.8 | 2018 |
| | | | 7.2 | 2019 |
| 25 | Ulaanbaatar City Constructure of a Green Kindergarten | Mongolia | 0.6 | 2018 |
| | | | 0.3 | 2019 |
| 26 | Mongolia Green Finance Corporation (MGFC) | Mongolia | 10.0 | 2018 |
| | | | 13.0 | 2019 |
| | | | 26.7 | 2020 |
| 27 | Joint Declaration of Intent on Deforestation – funding by Norway | Colombia | 250.0 | 2018 |

| # | Project Name | Country | Commitment (USD M) | Year |
|---|---|---|---|---|
| 28 | Distributed Solar PV Program, 14MW | Guyana | 18.0 | 2018 |
| 29 | Sonora State Green Bond to Implement the Sonora Green Growth Strategy and Finance the First Stage of BRT Development | Mexico | 25.0 | 2018 |
| 30 | Vientiane's Solid/Water Waste Management | Lao PDR | 2.3 | 2019 |
| 31 | Hungary-Balkan Regional Multi Donor Trust Fund | Hungary-Balkan | 6.0 | 2019 |
| 32 | Implementation of the Regional NDC Hub | Pacific Regional | 2.5 | 2018 |
| 33 | Electric Trikes for Palawan's Climate Resilient Green Growth | Philippines | 0.9 | 2019 |
| 34 | East Kalimantan Jurisdictional Emission Reductions Program | Indonesia | 180.0 | 2019 |
| 35 | Solar PV Project in Ovalau, 4.7 MW | Fiji | 19.8 | 2019 |
| 36 | Palm Oil Waste to Energy in Meta, 5.5MW | Colombia | 20.8 | 2019 |
| 37 | Design of Three PV-tied Mini-grid Systems | Guyana | 8.6 | 2019 |
| 38 | Design and Structuring of Solar PV system in Wakenaam Island | Guyana | 2.3 | 2019 |
| 39 | Electric Mobility Program, Phase II | Nepal | 26.0 | 2019 |
| 40 | Industrial-Scale Municipal Solid Waste to Energy Project | Viet Nam | 28.0 | 2019 |
| | | | 29.5 | 2020 |
| 41 | Solar for Small Off-grid Hotels, 500kW–1MW | Fiji | 3.0 | 2019 |
| 42 | Solar Cluster in Tolima | Colombia | 28.0 | 2019 |
| | | | 12.0 | 2020 |
| 43 | The Renewable and Energy Efficiency Fund (REEF) | Senegal | 5.0 | 2019 |
| 44 | Green Incubator & Accelerator Facility | Rwanda | 4.4 | 2019 |
| 45 | Green Infrastructure Planning and Delivery | Rwanda | 0.1 | 2019 |
| 46 | Inclusive Green Urban Development | Rwanda | 0.3 | 2019 |
| 47 | Green Investment Advisory Support – Public Bicycle Sharing (PBS) Scheme | Rwanda | 0.9 | 2019 |
| 48 | Utility scale 250MW Ground Mounted Solar PV Project for New Highway Corridor in Maharashtra | India | 145.0 | 2020 |
| 49 | Central Kalimantan Logging Concessions for Conservation Project | Indonesia | 15.0 | 2020 |
| 50 | Sustainable Coconut Sugar Production to Improve Livelihoods | Indonesia | 8.0 | 2020 |
| 51 | Projects for GCF REDD+ Result Based Payment | Indonesia | 103.8 | 2020 |
| 52 | Bataan 50MW Solar Farm Project | Philippines | 45.0 | 2020 |
| 53 | Greening 400 Telecommunication Towers in Colombia | Colombia | 32.0 | 2020 |
| 54 | Financing for Amazoniko's Greener Business Expansion | Colombia | 2.0 | 2020 |
| 55 | Digestate Plant, Cali (Biogas and digestate from Cali vegetable markets) | Colombia | 6.1 | 2020 |
| 56 | Accelerating Solar on Island Resorts Program | Fiji | 20.0 | 2020 |
| 57 | Supporting Fiji State-owned Enterprise in Accessing Finance to Access Solar Energy | Fiji | 3.6 | 2020 |
| 58 | Greening 114 Telecommunication Towers for Vanuatu – a Fuel Switch Project | Vanuatu | 10.0 | 2020 |
| 59 | Low Carbon Buses for the Bus Rapid Transit System in Vientiane | Lao PDR | 16.8 | 2020 |
| **Total (million USD)** | | | **2,051** | |

# ANNEX 2: GGGI GREEN INVESTMENT PORTFOLIO, 2015–2020

Below are summaries of the green investment projects prepared during 2015–2020. All values reported are in millions USD.

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 1 | Electric Buses in the State of Himachal Pradesh (under GGGI-TERI project) | India | 2015 | Sustainable Mobility | 5 |
| | | The project formulated a proposal to roll out 25 electric buses in Himachal Pradesh, India. Shimla, Nalagarh, and Solan cities were selected as operation sites. The proposal was built on an analysis of identifying optimal green development solutions, both at national and state levels. The analysis incorporated biophysical factors and cost-benefit analyses linking with sectoral and macro-economic implications of green growth. The study identified public electric transportation as an opportunity with multiple co-benefits of reduced emissions, noise pollution, and legal compliance as to the National Green Tribunal. The proposal also combined a unique analysis on using surplus hydropower for charging the buses at night.<br><br>GGGI and the Energy and Resources Institute played a key role in developing the proposal in close collaboration with the State Government of Himachal Pradesh. The state submitted the proposal to the Government of India and approved approximately USD 5 million for procuring e-buses under the Faster Adoption and Manufacturing of Electric Vehicles scheme. The scheme has been successfully implemented and became the first case to take steps to introduce electric buses for public transport in the nation. | | | |
| 2 | Green Growth Priorities Identified for Indonesia (under GGGI-TERI project) | Indonesia | 2015 | Cross-cutting | 5 |
| | | The project designed a green growth roadmap for Central Kalimantan Province, Indonesia. Murung Raya and Pulang Pisau were chosen as the pilot regions to develop green growth strategies. Five reports were published to identify key sectors for each regency as well as the overall strategic approach for the province. The identified green growth opportunities were in forestry, mining, plantations, energy, and some cross-cutting sectors for Murung Raya, while forestry, aquaculture, plantations, and renewable energy sectors were examined for Pulang Pisau. The result of the studies presented an extended cost-benefit analysis of green growth policy interventions in a peatland project in Central Kalimantan.<br><br>Reports were launched in a partnership between the Provincial Government of Central Kalimantan and GGGI as part of the Government of Indonesia's Green Growth Program led by the Ministry of National Development Planning, Indonesia. The adoption of green growth strategies in two pilot districts in Central Kalimantan prompted district authorities to set aside budgetary allocations of nearly USD 5 million for implementing parts of the strategies in 2016. | | | |
| 3 | Amazon Vision Program REDD+ | Colombia | 2015, 2016 | Sustainable Landscape | 125 |
| | | The overall objective of the project is to reduce emissions from deforestation in the subnational region of the Colombian Amazon and thereby contribute through the preservation of forests to climate protection. The program entails pledges for about USD 125 million for the next six years, which would be disbursed on a payments-for-results basis conditional upon the reporting, verification, registration, and retirement of the emission reductions from avoided deforestation by the Norwegian government.<br><br>GGGI worked closely with the government in developing an investment plan of priority activities to tackle deforestation drivers in two key municipalities, Caquetá and Guaviare. Support was provided for the drafting of operational documents and templates to ensure adequate implementation of the program. Additionally, the organization assisted in the methodological conception of the formulation process under the Indigenous Pillar of the Amazon to the structuring of the strategic lines of funding and the mechanisms to make them operational.<br><br>In 2017, no emission reductions were accredited since deforestation trends increased. Therefore, the total emission reductions available for payment would be USD 87 million instead of USD 125 million between 2016 and 2021. | | | |
| 4 | Norway REDD+ Implementation through Partnership | Ethiopia | 2016 | Sustainable Landscape | 80.0 |
| | | GGGI has been a key government partner in developing the REDD+ Strategy and investment proposal for implementation. GGGI supported the Government of Ethiopia in identifying priorities and development of investment proposals for areas in the agriculture, forestry, energy, and industry sectors as well as disaster risk management. Based on GGGI's support, USD 80 million was committed by Norway to implement REDD+ activities in the country. Planned REDD+ activities included two pilot sites for forest-based payment for ecosystem services opportunities, drafting of the REDD+ implementation guidelines for district level practitioners, and establishment of a national REDD+ learning platform for exchanging knowledge, advancing learning, identifying best practices, and recommending appropriate REDD+ policies to create a knowledge system for REDD+ in Ethiopia. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 5 | Environmental Bank Foundation (FUNBAM) | Costa Rica | 2017 | National Financing Vehicle | 1.0 |
| | | The project aimed to strengthen Costa Rica's Environmental Bank Foundation (FUNBAM) as a specialized financing vehicle for ecosystem management and sustainable development across the country. The Government of Costa Rica partnered with GGGI in 2017 to design, restructure, and scale up the fund with an investment target of USD 5 million by 2018.<br><br>GGGI provided technical assistance, particularly focusing on project pipeline development, financial structuring, and fundraising. A long list of pipeline projects was developed with FUNBAM, and two pipeline projects were selected to be prioritized for project development and resource mobilization. Additionally, GGGI provided an analysis of the current capacity, performance record, and legal structure of the fund and suggested measures to help transform FUNBAM into an independent financing entity. GGGI's engagement mobilized seed capital of approximately USD 1 million from the government.<br><br>The project was canceled in late 2018 due to a change in priorities of the new government moving away from the conservation agenda, which included reforestation, to a clear priority for decarbonization of the economy that would include green cities and urban planning, transport, and waste management. | | | |
| 6 | Support for Rural Communities Drought Resilience-Adaptation Fund | Ethiopia | 2017 | Sustainable Landscape | 10.0 |
| | | The objective of the project was to increase the resilience of seven drought-prone agro-ecological landscapes in Ethiopia by developing an integrated water, agriculture, and natural resource management strategy. This project was aligned with the Climate Resilient Green Economy (CRGE) strategy with the objectives of resilience building, poverty reduction, and climate change.<br><br>GGGI supported the accreditation of the Ministry of Finance and Economic Cooperation for direct access to the Adaptation Fund as the National Implementing Entity while supporting the development of this USD 9.98 million project proposal. Project implementation and disbursements started with the agreement being signed in April 2018. Six target woredas, namely Amhara, Oromia, SNNPR, Tigray, Harari, and Dire Dawa City Administration, have started implementing project activities. | | | |
| 7 | GCF Irrigation Systems Support | Ethiopia | 2017 | Sustainable Landscape | 50.0 |
| | | The overall objective of the project was to develop a GCF proposal to enhance critical irrigation systems in Ethiopian regions, such as woredas and kebeles that are regularly drought stricken, with a view to building gender-sensitive resilience while sustainably managing water resources. The project combines USD 45 million of GCF finance and USD 5 million from the Government of Ethiopia. Within a year, 330,000 people, of which 30% are female-headed households, are expected to be direct beneficiaries. The project is also expected to rehabilitate approximately 7,900 hectares of degraded land.<br><br>GGGI played the role of a delivery partner under the Readiness and Preparatory Support Program of the GCF. The project was approved with conditions in October 2017. GGGI supported in addressing these conditions, such as local capacity building in investment framework, policies, and procedures, following which the project received the first disbursement of USD 4 million in May 2019. In July 2019, GGGI participated in the first inception workshop with the implementing partners. | | | |
| 8 | Mekele City Water Project | Ethiopia | 2017 | Sustainable Landscape | 337.0 |
| | | The project demonstrated a plan to construct an impounding reservoir of approximately 328 million $m^3$ on Giba River, located 20 km from Mekele City, Tigray Regional State, the northernmost region of Ethiopia. Once the dam is completed, there will be water abstraction of 147,000 $m^3$/day from the reservoir conveyed to Mekele through six water transmission pipelines. The project will provide additional water supply in Mekele and resolve the water deficit derived from the overexploitation of existing groundwater sources, fast-growing demand, and poor water supply connections.<br><br>Upon the government's request, the project was co-developed by GGGI and the Ministry of Finance and Economic Cooperation with an initial investment size of USD 377 million to contribute to the target of improving the water supply aligned with the CRGE strategy, a national initiative for climate actions. The Government of China expressed interest in providing a long-term loan for this project to be implemented by a Chinese company. The final investment agreement of USD 250 million was signed with the company in 2018 in Beijing, in the presence of the Prime Minister of Ethiopia. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 9 | Solar PV Project on Taveuni Island | Fiji | 2017 | Solar | 3.5 |
| | | The project demonstrated a 1.55 MW ground-mounted solar plant in Taveuni Island, the third largest island in Fiji. The intervention aims to achieve a 50% share of electricity generation from solar, delivering an additional 2,100 MWh per year, and was conducted in partnership with the Ministry of Economy of the Republic of Fiji and Energy Fiji Limited (EFL). Once implemented, the project is expected to deliver clean electricity to roughly half of the total households in Taveuni and strengthen energy security by reducing diesel imports. GGGI's feasibility studies for the project outlined solar PV as the most viable source of renewable energy, which brought key stakeholders together.<br><br>Facilitated by GGGI's discussions and negotiations, Korea International Cooperation Agency (KOICA) provided a grant aid of USD 3.5 million to the ministry for construction and to strengthen operational capacity, based on the full feasibility study. The ministry made a formal announcement indicating its progress in July 2019, with a tender to be published in the future; environmental permit requests are being processed. | | | |
| 10 | Bangalore Metropolitan Transport Cooperation | India | 2017 | Sustainable Mobility | 30.0 |
| | | The project was designed to deploy 150 electric buses in Bangalore, the capital city of Karnataka, India. The investment size of the project was estimated to be USD 15 million. The bus would require about 260 kWh of energy for the daily operation of around 210 km. The first phase of the project aims to deploy 50 buses with 75 charging stations. The majority of the charging infrastructures are planned to be stationed at the Bangalore Metropolitan Transport Corporation (BMTC) depots No. 7 and 13. Regarding environmental benefits, the intervention is expected to reduce the noise level by 30%, compared to a diesel bus, and have zero tailpipe emissions.<br><br>GGGI, in tandem with BMTC, conducted a joint study that demonstrated electric buses as a preferred option against diesel buses when considering environmental, technical, and socioeconomic benefits. The study included approaches to optimize system-level costs by analyzing product specification, operational and management costs, and total cost of ownership. With the study in place, GGGI supported BMTC in arranging a funding proposal to the Department of Heavy Industries, GoI. BMTC issued a tender for 150 e-buses by end of 2017; however, the funding proposal only approved the subsidy for 40 buses in January 2018, and BMTC had to reissue the tender with a reduced number of e-buses. After minor delays during 2019, the project was piloted in October 2020, and the number of buses has risen to 300 buses. | | | |
| 11 | Solar PV Project Nusa Tenggara Timur (NTT) | Indonesia | 2017 | Solar | 15.0 |
| | | The project was initiated to develop diesel hybrid on-grid solar PV systems with a total capacity of 15 MW in Nusa Tenggara Timur (NTT), Indonesia. The investment size of the project is estimated to be USD 15 million. The facilities are planned to be installed in eight locations, including Kalabahi, Ba'a, and Kefamenanu, which used to be diesel power plants. The intervention will provide energy access to 41% of the total households in the area and replace 16–23% of diesel energy, reducing 438,000–549,000 metric $tCO_2e$ over the project's lifetime.<br><br>GGGI designed solar PV installations of optimal size, along with battery system options, and performed financial analysis for the proposed designs at the request of the governor of NTT in October 2016. The study has been taken for further investment consideration by a consortium comprised of a state-owned enterprise and an energy company based in Japan and Singapore. Currently, a business manager was hired to monitor four of the project sites in NTT, of which the selections were based on the recommendations from GGGI's assessment in 2017. | | | |
| 12 | Solar PV Project Mandalika | Indonesia | 2017 | Solar | 17.5 |
| | | The project was designed to demonstrate a solar energy supply with an installed capacity of 10 MW for a tourism Special Economic Zone called Mandalika on Lombok Island, Indonesia. The investment size of the project was estimated to be USD 12–18 million. This project is one of the first commercial utility-scale solar PVs in the country with an aim to scale up to at least 50 MW in size. GGGI partnered with Indonesia Tourism Development Corporation (ITDC), the project owner that provided the land for the solar PV installation, and PT Sarana Multi Infrastruktur, the infrastructure bank that prepared the project for investment.<br><br>With the partnership in place, GGGI designed the technical feasibility studies regarding existing grid and energy grid assessment, resource characterization analysis, and smart grid options. Likewise, financial feasibility studies were also conducted by GGGI, which included financial structures, profitability analysis, expected revenues, and costs. The studies concluded that the preferred model is a grid-connected solar PV plant. This plant will sell all the power generated to PLN (state-owned utility) under a 25-year PPA.<br><br>Recently, a 5 MW solar PV in Sambelia was fully constructed to supply power, in addition to six other solar PVs already running in 2020. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 13 | Vanuatu National Green Energy Fund (NGEF) | Vanuatu | 2017, 2018, 2019, 2020 | National Financing Vehicle | 3.0 |
| | | In 2015–2016, GGGI developed the National Energy Road Map, stipulating the need for a financing mechanism for energy access and green energy projects. The Vanuatu National Green Energy Fund (NGEF) was established with GGGI support at the request of the Government of Vanuatu. The aim of the project was to design, establish, and operationalize the fund. The number of direct beneficiaries is estimated at 45,000 people/5,000 households with improved electricity access.<br><br>During 2016–2018, GGGI played a key role in setting up the governance structure, processes, and manuals for the management and operation of the fund as well as the incorporation of the NGEF into relevant government legislation. Further, GGGI engaged in resource mobilization by providing support in investment analysis and pipeline development for the fund from various government sources and international funders, securing USD 3 million between 2017 and 2020. GGGI continues to support the fund with funding proposals, project design, and origination. | | | |
| 14 | Green City Pilot Project | Rwanda | 2017 | Cross-cutting | 60.0 |
| | | A blueprint of a green city was designed in the Kinyinya subdivision of Gasabo district, Kigali city, Rwanda. Horizon Group has acquired 13 hectares of land in the Kinyinya sector of Gasabo district and will use this land for developing sustainable housing infrastructure with multiple green aspects to be incorporated, such as resource conservation, renewable energy, land use efficiency, and pollution management technologies. It will act as a pilot for laying the groundwork for scaling up green urban planning projects. Also known as Cactus Green Park, the project will demonstrate green economy benefits through employment as well as setting an economic base through the construction of apartments worth USD 60 million in investment size.<br><br>GGGI completed the architectural drawings and pricing structures in partnership with the Rwanda Environment Fund (FONERWA). The support allowed the Horizon Group to complete its business planning and move forward with the project development. The KfW, the German state-owned development bank, expressed interest in further supporting the project, and the project is currently being executed in the name of Green City Kigali. | | | |
| 15 | Strengthening Climate Resilience of Rural Communities in Northern Rwanda (SCRNRP) | Rwanda | 2018 | Sustainable Landscape | 33.0 |
| | | The project was developed to increase the resilience of vulnerable communities to climate change in the Gicumbi district in Northern Rwanda. The project targets nine subdivisions in Gicumbi with 63% of the district's population. The subdivisions fall within the sub-catchment of the Muvumba watershed and comprise around 252 villages. The scheme will entail restoring the watershed and building climate-resilient settlements for households by reducing the risk of flooding and landslides. The intervention is also adopting sustainable forest management practices to create a wide range of forest products. Best practice approaches implemented during the project will be shared and mainstreamed for replication and scale-up in other districts.<br><br>GGGI supported the Ministry of Environment in mobilizing a grant of USD 33 million from GCF by designing and developing the work plan and the proposal. The project began in October 2019 and has succeeded in achieving targets for the planned activities despite the challenges of the COVID-19 pandemic. | | | |
| 16 | FONERWA – Rwanda's Green Fund funding by SIDA | Rwanda | 2018 | National Financing Vehicle | 4.0 |
| | | Rwanda's Green Fund (FONERWA) is the primary national financing vehicle through which environment and climate change finance is channeled, programmed, disbursed, and monitored in Rwanda. GGGI has been engaged with FONERWA since the beginning of its country operation. This funding commitment was an achievement during GGGI's effort to increase efficiency, sustainability, and the impact of FONERWA with an aim to bring new sources of capital to the fund.<br><br>GGGI provided direct support in preparation of the proposal of USD 5 million to the Swedish International Development Cooperation Agency (SIDA). The proposal leveraged GGGI's technical assistance in (i) building management capacity, (ii) developing bankable projects, and (iii) residing its business model (from grant based to grant hybrid). GGGI's support in the development of the business plan led to the revision of the law governing FONERWA, giving it a special status that allowed the fund to become more independent from the government, thereby enabling it to play a bigger role in resource mobilization. | | | |
| 17 | Development of Eco-tourism Park in Kigali – Wetland, Nyangungu | Rwanda | 2018 | Sustainable Landscape | 1.7 |
| | | The project focused on restoring the degraded urban wetland called Nyandungu, in Kigali. The project resulted in securing EUR 1 million from the Italian Ministry for the Environment, Land and Sea (IMELS) and USD 0.6 million from the GCF in 2018. The project seeks to increase biodiversity, reduce flood risk, raise awareness of wetland conservation, create green jobs, and promote tourism. It will display a sustainable model of wetland management using green technologies and promote native trees. The knowledge gained during this process will be used to promote similar strategies elsewhere in Rwanda, especially in secondary cities.<br><br>GGGI supported the Rwanda Environment Management Authority to design and develop this project proposal for the IMELS. Further, as a GCF Readiness Delivery Partner, GGGI aided project documentation, monitoring, and evaluation through the GCF Readiness Program. GGGI continues to provide technical advisory support to the project. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 18 | Rice Husk Waste to Energy Projects for 3 Rice Mills | Senegal | 2018 | Waste | 1.7 |
| | | The project demonstrated a scheme to generate energy from rice husk waste produced from three rice mills—Teranga Sarl, Vital Argo Industries, and Columba Nor Thiam Suarl—located at Senegal River Valley in Saint Louis, Senegal, where 60% of the total rice production in Senegal occurs. The total capacity of gasification units, installed to all sites, adds up to 0.63 MW. If implemented, the operations are estimated to mitigate GHGs by 158.33 $tCO_2e$ annually. According to the technical and financial assessment implemented by GGGI, reduced energy generation costs through this alternatives source would bring a return on investment of over 4% on average per year, while the total CAPEX is estimated to be USD 1.7 million.<br><br>Facilitated by the work plan, the Agricultural Bank of Senegal and Ankur Scientifics have agreed on identifying an appropriate financial structure and technology for the project in association with GGGI and the rice mills. However, progress has not been made due to a delay in the GCF accreditation process and a lack of internal resources in the bank. | | | |
| 19 | Solar Irrigation Systems for 150 Farms in Manica Province | Mozambique | 2018 | Solar | 13.5 |
| | | The overall objective of the project was to scale-up off-grid renewable power for the agriculture sector in Manica, Mozambique. The project focused on the displacement of existing fossil fuel-based generation as well as the introduction of renewable energy-based technologies, mainly solar.<br><br>GGGI led the design, structuring, and aggregation of solar irrigation projects in areas affected by low electricity access and high poverty rates. The designed solutions will be implemented by FUNAE, the Mozambique National Energy Fund, across 150 medium-scale farms, increasing the food security and climate change resilience of over 1,000 households. FUNAE committed to pursuing the development and financing of USD 14 million for solar irrigation solutions across 1,128 hectares. | | | |
| 20 | Climate-Resilient Green Economy (CRGE) Facility | Ethiopia | 2016, 2018 | National Financing Vehicle | 89.0 |
| | | Ethiopia's CRGE Initiative, developed by Ethiopia, outlines the vision, strategy, financing strategy, and institutional arrangements Ethiopia will need to attain the triple goals of economic growth, net-zero emissions, and building resilience. To support the implementation of the priorities set out in the CRGE Strategy and Investment Plans, the government set up a national financial vehicle known as the Ethiopia CRGE Facility.<br><br>GGGI has been engaged since the development of the CRGE initiative and, in 2015, prepared a proposal of USD 21 million to fast-track investments across seven sectors, approved under the CRGE Facility. In 2018, GGGI supported the development of three proposals: 1) The Phase 2 Participatory Forest Management Program for community livelihoods in the Kaffa Biosphere Reserve, where approximately USD 7 million was secured from DANIDA. 2) the Climate Change Budget Support Program, with a goal of reducing GHG emissions in the forest and cement sectors and building MRV capacity, which secured USD 40.9 million for implementation from the EU Commission. 3) The Establishment of the Climate Resilient Water Sanitation and Hygiene System, which aims to facilitate an increase of water supply to the Somali Regional State and City of Harar and successfully obtained a USD 20 million grant from DFID. | | | |
| 21 | First SME-only National Energy Efficiency Program Target at Replacing Lighting, Motors and Variable Speed Drives | Thailand | 2018 | Cross-cutting | 20.0 |
| | | The program focused on promoting energy efficiency investments in the SME sector in Thailand. GGGI conducted energy audits in 220 SMEs across different sectors to aggregate demand for the investments. Based on the audit results, an energy efficiency business model was developed to address investment barriers, such as high upfront costs and a lack of access to financing. GGGI, in cooperation with the Provincial Electricity Authority, has designed an on-bill repayment mechanism that allows SMEs to pay for energy efficiency upgrades directly with cost savings through their utility bills, which eliminates a major barrier for SMEs: the high upfront capital requirements. Low-carbon technologies for lighting, motors, and variable speed drives are to be applied as tools to reduce energy usage, with projections of curtailing 140,000 $tCO_2e$ per year.<br><br>In 2018, EESL expressed interest in investing USD 20 million in the program. However, at the time of this report preparation, no progress has been made since a tentative investment letter was issued by EESL in 2018. | | | |
| 22 | Energy Efficiency Projects in the SME Sector | Thailand | 2018 | Cross-cutting | 1.2 |
| | | The aim of the project was to implement Thailand's NDC action plan for the industrial sector, developed by GGGI during 2014–2016, by identifying potential energy efficiency improvements within the factory boundary. Two green project proposals were developed by GGGI in the form of Investment Grade Audit (IGA) reports based on preliminary utility assessments and customer requirements. The reports entailed a thoroughly calculated and detailed analysis to identify cost-effective energy conservation measures. In addition, the IGA presented the financial analyses of proposed measures to show the bankability of the project. Based on this, commitment to invest was secured from Cotco Metal Works, who have subsequently implemented the energy conservation measures in one of their factories by replacing the galvanizing furnace. According to a GGGI evaluation in 2019, the actual cost of the investment was USD 2 million. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 23 | Vanuatu Outer Island Solar Powered Pumping System Project | Vanuatu | 2018 | Solar | 1.8 |
| | | The overall project objective was to increase resilience in rural Ni-Vanuatu village communities through implementation of solar-powered water pumps and by strengthening the institutional environment for management of solar water pumping systems and water resources. The project aimed to 1) address the rural water sector's lack of adaptive capacity and vulnerability to adverse climate effects and 2) to remove barriers to the wide-scale utilization of solar power to meet water needs.<br><br>GGGI played a key role in updating the National Energy Road Map, which led to the development of a funding proposal to the Government of Luxembourg that included the installation of 30 cyclone-resistant standard solar PV–powered water pumping units, along with policy enabling technical assistance. Currently, the project is under implementation, to be completed in 2022. | | | |
| 24 | Ulaanbaatar City Thermo-technical retrofitting of residential buildings | Mongolia | 2018, 2019 | Cross-cutting | 12.0 |
| | | The project was designed to improve energy efficiency by retrofitting the walls, roof, and basement of residential buildings in Ulaanbaatar, Mongolia. The project started with a pilot covering the energy audit of three residential buildings and was developed into a project proposal for Mongolia's NDC contribution. The project explored energy performance contracting models and monetization of energy savings under a standard offer approach. The effort resulted in the allocation of USD 12 million from the state budget during 2018–2019.<br><br>GGGI led the project design in partnership with the Mayor's Office of Ulaanbaatar city and the Energy Regulatory Commission. GGGI played an instrumental role in advocating the implementation of a residential building heat loss reduction as well as introducing innovative financing mechanisms to attract green climate financing. In 2020, the project was awarded funding of USD 20 million through the NAMA Facility 6th Call with an expanded scope of 375 buildings and is expected to significantly contribute to Mongolia's NDC. | | | |
| 25 | Ulaanbaatar City Construction of a Green Kindergarten | Mongolia | 2018, 2019 | Cross-cutting | 0.9 |
| | | The project demonstrated a pilot plan to replace the coal-operated heat only boiler (HOB) with ground source heat pumps in combination with electric boilers at the 122nd Public School located in Songino Khairkhan district, Ulaanbaatar City. The intervention would curtail carbon dioxide ($CO_2$) emissions by 133 tons and air pollutants by 42 tons, with an upfront investment cost of MNT 630 million and an estimated payback period of 10 years.<br><br>GGGI identified the program as technically reliable and financially viable, considering heating subsidies are provided by the government to off-grid public buildings. The study has led to an equity investment of USD 0.86 million from the Municipality of Ulaanbaatar and the Ministry of Environment in 2018 and an additional USD 0.26 million from the Ministry of Environment and Tourism in 2019. Tendering and construction took place in 2019 and are completed. | | | |
| 26 | Mongolia Green Finance Corporation (MGCF) | Mongolia | 2018, 2019, 2020 | National Financing Vehicle | 49.7 |
| | | The MGCF is developed as an NFV that provides households and businesses with affordable financing for low-carbon technologies in Mongolia. The vehicle aims, in its first stage, to finance thermo-retrofitting solutions of existing houses, energy efficiency measures of energy-intensive users, and green mortgages for energy-efficient housing, targeting households living in peri-urban (ger) areas of Ulaanbaatar. The MGFC is projected to bring at least direct GHG emission reductions of 3.7M $tCO_2e$ and indirect upstream economic lifetime GHG emissions reductions of 0.3M $tCO_2e$. It will also create 1470 jobs, of which at least 588 are held by women. MGFC is the first NFV developed by GGGI, the first green bank funded by GCF, and the first joint PPP initiative for the financial sector in Mongolia.<br><br>In 2015, GGGI, initiated discussions with the GoM and the Mongolian Bankers Association on establishing an NFV for Mongolia and led market assessments and concept developments during 2016–2017 while securing co-investors along the journey. GGGI continued its engagement until the development and approval of the MGFC GCF proposal in 2020. MGFC succeeded in mobilizing USD 18 million from the GoM, USD 5 million from domestic private banks, and USD 26.7 million in GCF funding. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 27 | Joint Declaration of Intent on Deforestation – funding by Norway | Colombia | 2018 | Sustainable Landscape | 250.0 |
| | | The Joint Declaration of Intent on Deforestation (JDI) is a partnership between the governments of Colombia, Norway, Germany, and the United Kingdom. The objective of the program is to reduce GHG emissions from deforestation and forest degradation as well as promoting sustainable development in Colombia. The partnership is structured based on two modalities, with modality 1 being contributions for policy objectives and implementation and modality 2 being contributions for verified emission reductions at the national level.<br><br>Since 2017, GGGI has been actively implementing the JDI as a partner to the Government of Colombia and has played a key role in the negotiation team for extending the agreement beyond 2020. This included an additional five-year contribution from Norway of USD 250 million under modality 1. Moreover, GGGI supported the following milestones: (i) the establishment of a public-private coalition with companies committed to ambitious zero deforestation policies and (ii) the redesign of incentives in existing economic practices.<br><br>The renewed JDI acknowledges the Leticia Declaration—an agreement between the governments of Colombia, Ecuador, Bolivia, Peru, Brazil, Guyana, and Surinam—to further address the fight against deforestation. This alliance will design a joint monitoring system to identify sources of fires and combat illegal activities that threaten the conservation of the Amazon, especially deforestation. Additionally, it will support Colombia JDI goals with a payment of up to USD 366 million until 2025. | | | |
| 28 | Distributed Solar PV Program, 14MW | Guyana | 2018 | Sustainable Landscape | 18.0 |
| | | The overall objective of the project was to develop a 14 MW distributed solar PV in Guyana. The project was able to engage 34 private sector companies, allowing them to green their source of electricity. An LoI was secured from two private sector partners, with an investment commitment of USD 18 million.<br><br>GGGI engagement on the project focused on tackling the following hurdles: (i) a lack of awareness among local private stakeholders, (ii) a regulatory barrier of a 0.1 MWp cap on connecting to the grid imposed by the utility, and (iii) a lack of funding. Furthermore, GGGI visited local companies to raise awareness and provide them with technical and financial solutions to implement solar power in their facilities. At the time of the preparation of this report, USD 5 million has been secured to be invested during 2020–2021 by a leasing company. | | | |
| 29 | Sonora State Green Bond to implement the Sonora Green Growth Strategy and finance the first stage of BRT development | Mexico | 2018 | Cross-cutting | 25.0 |
| | | The project entailed designing a green bond framework for the State of Sonora, Mexico, with the target to issue the first subnational green bond of USD 25 million. The issuance is denominated in Mexican pesos, with a tenure of 20 years and a coupon rate of 0.5% + TIIE. Green bond proceeds will be used to finance the Sonora Green Growth Strategy, including the refinancing of outstanding eligible debt and a bus rapid transit system in the capital city of Hermosillo. The Sonora Green Bond Framework is aligned with the Climate Bond Taxonomy and was approved by the State Treasury in 2018. GGGI played a key role in 2018 in designing the green bond's framework, with the aim to finance the implementation of the priority set out in the state's green growth strategy, which was also developed by GGGI in previous years.<br><br>However, at the time of the preparation of this report, it was noted that after expressing initial interest and accepting GGGI's Green Bond Framework delivered in 2018, the Sonora State Treasurer rejected the bond in 2019 as the state's financial conditions were not favorable for an issuance of green bonds due to its debt ceiling, in accordance with the Fiscal Discipline Law. The State of Sonora and the State Treasurer expressed their hope to resume this initiative in the future. | | | |
| 30 | Vientiane's Solid/ Water Waste Management | Lao PDR | 2019 | Waste | 2.3 |
| | | The project intended to improve a wastewater treatment system in Pakse located in the southern region of Lao PDR. The scope of the project was the construction of four decentralized wastewater treatment systems in Phon Koung village, Thong village, Phongsa-art village, and Ke village and one fecal sludge management (FSM) plant in Pakse City. The project sites are dense residential areas where a large volume of wastewater flows directly into the Xe Don River and Mekong River without any treatment. An FSM plant was suggested for emptying and treating fecal sludge from 13,436 households with 80,951 people in 42 villages, the whole area of Pakse municipality. GGGI played a key role in the preparation of the project proposal, which was granted USD 2.3 million from KOICA.<br><br>The work is under implementation, with the blueprint of the scheme being developed and operation and management guidelines for the plants progressing. Additionally, GGGI remains involved at the national level to support improvements to the National Urban Sanitation Strategy through cost-effective, sustainable, inclusive, and gender-responsive approaches. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 31 | Hungary-Balkan Regional Multi Donor Trust Fund | Hungary-Balkan | 2019 | National Financing Vehicle | 6.0 |
| | | The program was designed to build a trust fund to finance a strong pipeline of green projects in the Western Balkans, covering the Republic of Albania, Bosnia and Herzegovina, Kosovo, the Republic of Macedonia, Montenegro, and the Republic of Serbia. The Western Balkan Multi-donor Green Fund will launch in 2022 and catalyze private sector investments by utilizing market-based approaches such as loans complemented with grants. In 2018, the Government of Hungary approved the establishment of the Western Balkans Green Center, along with its financial provisions, for three years as an instrument to develop bankable projects in the region with the aim of providing a project pipeline to the fund.<br><br>GGGI carried out the design of the blueprint, including the development of the financial instrument framework, the governance model, and monitoring and reporting frameworks. The government's decision for the establishment of the fund is in progress. | | | |
| 32 | Implementation of the Regional NDC Hub | Pacific Regional | 2018 | Cross-cutting | 2.5 |
| | | The aim of the project was to assist Pacific Island Countries in enhancing and implementing their country's NDCs by driving sustainable and resilient development. To do so, the hub provides technical assistance and training workshops to its Members.<br><br>GGGI partnered with GIZ, SPREP, SPC, and the NDC-Partnership to establish the hub, which is owned by the 14 countries through a Steering Committee. GGGI supported the hub in 1) preparing NDC implementation roadmaps, 2) NDC investment plans, 3) project pipelines, and 4) MRV system establishment and enhancements. | | | |
| 33 | Electric Trikes for Palawan's Climate Resilient Green Growth | Philippines | 2019 | Sustainable Mobility | 0.9 |
| | | The project was proposed to replace gasoline-led tricycles with electric tricycles in Brooke's Point and San Vincente of Palawan, Philippines. Each municipality will operate 50 electric tricycles (e-trikes) respectively as the seed investment to further drive the transformation. The municipalities have provided an in-kind contribution, including electric tricycles and charging stations, with a fee-based lease arrangement. The fees collected will enable the local governments to enhance the capacity of charging stations, provide maintenance service of the e-trikes, and purchase more e-trikes, creating a revolving grant arrangement. E-trike drivers will be supported by a special financing arrangement that enables them to own the vehicles by paying a daily fee over a period four to five years while they save on fuel costs of 194.50 pesos per day.<br><br>GGGI supported the Palawan municipalities in providing technical analysis and in the preparation of the documentary requirements for the grant application, mobilizing a grant of USD 910,000 from the ADB. | | | |
| 34 | East Kalimantan Jurisdictional Emission Reductions Program | Indonesia | 2019 | Sustainable Landscape | 180.0 |
| | | The ERP is a jurisdictional approach to incentivize and enforce action in key sectors—such as forestry, agriculture, and mining—implemented and administered by the provincial government, in accordance with national policies and systems. This RBP program for a REDD+ initiative will be financed by the FCPF Carbon Fund under an agreement between the GoI and the WB. The entire 12.7 Mha of forest in the East Kalimantan province was selected for the first step toward the establishment of a national REDD+ framework, given its high deforestation rate of 18% between 2001 and 2019, together with a still-extensive forest area and capable institutions committed to green growth.<br><br>GGGI played a pivotal role in supporting the design of East Kalimantan's ERP and mainstreaming the ERP into its Medium-Term Development Plan (2018–2023) and budget. In parallel, GGGI provided capacity-building for all 20 FMUs in the province to develop business plans aligned with the goals and opportunities of the ERP, which includes incentives and benefits for FMUs and village communities. The total budget support from the GoI toward the implementation of ERP activities will be USD 69.5 million. In addition, if the ERP succeeds in reducing emissions up to 61.3 million $tCO_2e$ during 2020–2024, the Carbon Fund will make payments for a verified 22 million $tCO_2e$ at the price of USD 5/ $tCO_2e$, equivalent to a total of USD 110 million. | | | |
| 35 | Solar PV Project in Ovalau, 4.7 MW | Fiji | 2019 | Solar | 19.8 |
| | | The project demonstrated a 4.7 MW ground-mounted solar plant with an energy storage capacity of 5.7 MWh per day in Ovalau, the sixth largest island in Fiji. An agrophotovoltaic system was introduced since the only viable site for solar PV was on agricultural land owned by the nearby village communities. The system allows sharing land with agriculture while providing a climate-resilient condition with shades that reduce water evaporation and heat stress on crops. The Bureta site was assessed to be the most viable location during the project. The project aims to achieve a 50% share of electricity generation from renewable energy during the first phase and is expected to provide 1,719 households with access to clean energy and reduce 3,382 $tCO_2e$ a year.<br><br>GGGI led the technical and financial assessment for reaching 100% renewable energy in Ovalau and identified the most viable means, including locations and financial structuring. GGGI's financial feasibility analysis stressed the importance of concessionality and foreign aid due to the high upfront cost and smaller scale, which makes it difficult to attract commercial players. Based on the study, a total of USD 19.8 million was mobilized from GCF, Fiji Development Bank, KOICA, and a private energy company. The project was approved by GCF in 2020 and with the financials closed, the project is proceeding to implementation. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 36 | Palm Oil Waste to Energy in Meta, 5.5MW | Colombia | 2019 | Waste | 20.8 |
| | | The project was to design and finance the expansion of a palm oil waste-to-energy plant from 1.6 MW to 5.5 MW in Meta, Colombia. The project has secured an investment commitment of USD 20.8 million from a local private operator. This expansion would mitigate the mill's carbon footprint, halve its electricity cost, and reduce its dependence on diesel generators, with excess electricity being used to power surrounding rural users.<br><br>GGGI's role was to provide project preparation support by co-designing the basic engineering of the plant and to share international best practices with the aim of reducing the perceived technology risk of the project and improving its financial viability. The work required close engagement with private or public sector actors to determine market appetite and to ensure political buy-in from decision-makers. At the time of the preparation of this report, the implementation process has been delayed due to the COVID-19 pandemic. | | | |
| 37 | Design of Three PV-tied Mini Grid Systems | Guyana | 2019 | Solar | 8.6 |
| | | The main objective of the project was to address energy diversification policy goals of the Government of Guyana by developing a small-scale grid connected solar PV systems in the Hinterland, with unreliable access to energy. The project consisted of the installation of three PV-diesel hybrid systems in Bartica (1.5 MW), Lethem (1 MW), and Mahdia (0.65 MW), totaling 3.15 MW. The implementation of these three projects will increase the share of electricity produced with solar PV in the three townships, from 0% to 27%, and will benefit more than 24,000 residents, largely comprised of indigenous Amerindians.<br><br>GGGI's support was instrumental in ensuring the standards of the technical tender documents, including the technical specifications of PV modules, structure and arrays, inverters, and other system components. The projects will be financed with a USD 9 million concessional loan from the Inter-American Development Bank and executed by Guyana Energy Agency. At the time of the preparation of this report, the current disbursement to the projects has been USD 2 million. | | | |
| 38 | Design and Structuring of Solar PV system in Wakenaam Island | Guyana | 2019 | Solar | 2.3 |
| | | The project was initiated to develop solar PV systems with a total capacity of 600 kWp on Wakenaam island, Guyana. The intervention will provide energy at a cost of 67.2 GYD/kWh, which is 15% cheaper than business-as-usual and will supply the island with about 80% of its energy requirements. The project will be financed with a USD 3 million grant from the UAE-Caribbean Renewable Energy Fund.<br><br>GGGI provided support to the main electric utility, Guyana Power and Light Inc., by conducting the technical and financial pre-feasibility analysis, which included the aforementioned cost details. | | | |
| 39 | Electric Mobility Program, Phase II | Nepal | 2019 | Sustainable Mobility | 26.0 |
| | | The project was designed to provide technical and investment analysis with an aim to roll out electric buses across Nepal. Built on the pre-feasibility study on electric bus deployment in Kathmandu Valley, the project undertook an expanded feasibility study and investment proposal, which included both technical-engineering and financial analysis relevant for the deployment of 50 electric buses in Kathmandu within public bus operator Sajha Yatayat's fleet. The analysis entailed the process of scoping destinations, routes, and stops at the provincial and metropolitan levels; examining grid viability for the installation of charging stations; and assessing specifications of vehicles and charging stations, among others. In consideration of wider social issues, battery reuse options were explored to minimize e-waste from an increased presence of electric buses. Gender equality and social inclusion options were also reviewed in the investment proposal.<br><br>These GGGI's analyses supported the GoN's decision to invest USD 26 million in electric buses in 2019. The investment is expected to allow the operator to procure approximately 250 electric buses during the next five-year period and deploy these through staggered stages across all seven provinces of Nepal. Procurement of the first installment of 40 buses is ongoing. | | | |
| 40 | First Advanced Municipal Solid Waste to Energy Project | Viet Nam | 2019, 2020 | Waste | 57.5 |
| | | The project demonstrated a MSWTE power plant in Que Vo district, Bac Ninh province, Viet Nam. This first-of-its-kind 10 MWe plant will process 500 tons of waste daily once constructed. MSW accounts for up to 82% of collected waste disposed in a landfill in Viet Nam, and the potential for scalability of the project model is up to 20 advanced MSWTE plants in secondary cities with an estimated capital expenditure of USD 1 billion.<br><br>In close partnership with the EEPM, GGGI identified and screened potential MSWTE project developers in Viet Nam and established a feasible business model for the plant. The project leveraged blended financing of USD 57.5 million between 2019 and 2020 from development finance institutions and a local commercial bank in Viet Nam. Currently, the project is undergoing due diligence and negotiation among the initially committed financiers before reaching the funding agreement. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 41 | Solar for Small Off-grid Hotels, 500kW – 1MW | Fiji | 2019 | Solar | 3.0 |
| | | The project demonstrated an off-grid solar plant on a hotel located in Tokoriki Island, Fiji, with an aim to scale up by triggering more solar business cases for small and medium-sized hotels in Fiji. The installed capacity is estimated to be 1 MW and is expected to reduce 690 $tCO_2e$ annually by replacing existing diesel generators. Appropriate solar systems and cost analysis were determined based on an energy survey conducted to understand energy consumption patterns of small and medium-sized hotels and their interest in utilizing solar power. Financial mechanisms were considered to tackle the barrier of high upfront investment costs for small or community-owned hotels, such as PV installations based on leases or grants and mobile platforms for payment that can cut electricity from solar panels in case of payment delays.<br><br>GGGI played a central role in designing the project, which contributed to mobilizing a USD 3 million investment commitment from a solar power services company for the project implementation. | | | |
| 42 | Solar Cluster in Tolima | Colombia | 2019, 2020 | Solar | 40.0 |
| | | The project was proposed to reevaluate a single 48 MWp solar PV plant to a clustered 4x12 Mwp in Tolima, Colombia. The cluster approach exempted the project from CERE (energy price costs) fees since projects under 20 MWac are not required to dispatch electricity centrally, allowing marketing of discrete energy blocks that result in investment savings. The reduced operational expenses, timing, modularity, and scale advantages made the project highly competitive, leading to the signing of a USD 40 million LoI between a private developer and an international investor. The project is expected to avoid emissions of 434,280 $tCO_2e$ during its project lifetime.<br><br>GGGI played a key role in the adaptation of a clustered approach by providing technical capacity in designing and structuring the cluster. It also executed an environmental and social permitting assessment and conducted market sounding, leading to the identification of two private sector investors. The parties are currently undergoing a due diligence process to materialize the investment by an international project sponsor. Power marketing is concluded, and financial close is expected by the end of Q2 2021. Construction is estimated to take nine months, leading to an expected commercial operation date in Q1 2022. | | | |
| 43 | The Renewable and Energy Efficiency Fund (REEF) | Senegal | 2019 | National Financing Vehicle | 5.0 |
| | | The Renewable and Energy Efficiency Fund (REEF) was developed to support the Government of Senegal in providing equity and subordinated debt to renewable energy and energy efficiency projects and in attracting additional financing from local banks and financial institutions. GGGI, in collaboration with the Sovereign Fund for Strategic Investments (FONSIS), a sovereign wealth fund established by the Government of Senegal, has been supporting the design and the structuring of the REEF as well as the preparation of one GCF concept note and full proposal for its capitalization.<br><br>FONSIS has committed to investing USD 5 million in the REEF as seed funding and will set up a legal entity in which it will co-invest with Fieldstone, a private investment bank and financial services provider in energy and infrastructure in Africa. The first financial closure was delayed to Q1 2022, with a USD 100 million target. | | | |
| 44 | Green Incubator & Accelerator Facility (IMELS - GGGI Contribution Agreement) | Rwanda | 2019 | National Financing Vehicle | 4.4 |
| | | GGGI and the Italian Ministry for the Environment, Land and Sea (IMELS) have initiated cooperation in the field of Climate Change Vulnerability, Mitigation, and Adaptation in Rwanda, formalized in a Contribution Agreement, signed in January 2018. This initiative centers on supporting the implementation of the MoU signed in November 2016 between IMELS and the Rwanda Ministry of Environment, in the field of vulnerability to climate change, risk assessment, adaptation, and mitigation. Eleven priority areas were identified under the MoU that were in common interest with GGGI's mission. As one of the first projects under the initiative, an incubator and accelerator facility was designed with an SPV to support venture firms developing green technologies. Establishment of this facility is expected to contribute to achieving the NDC target and green job creation. Further, knowledge and communication by-products, such as ITV live talks and radio live talks, were produced during the implementation. USD 4.43 million was catalyzed under the bilateral agreement between IMELS and the Government of Rwanda to further support the development of the incubator and accelerator facility. The IMELS will explore the possibility of locating other sources of financing, including the Italian Development Bank. | | | |
| 45 | Green Infrastructure Planning and Delivery | Rwanda | 2019 | Cross-cutting | 0.1 |
| | | The intervention supported demonstration projects in Kigali and Muhanga in Rwanda with USD 100,000 in financial support from Urban LEDS II as part of a larger framework of a green urban planning process for districts undergoing rapid urbanization due to a high population growth rate. The intervention identified the retrofitting of two health centers in Kigali and Muhanga as per the green building minimum compliance system as the demonstration projects. GGGI provided technical advisory services, including feasibility studies, participatory planning exercises, and green building technical advisory services. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 46 | Inclusive Green Urban Development | Rwanda | 2019 | Cross-cutting | 0.3 |
| | | The aim of the project was to design a green public space in Nyagatare, Rwanda. This intervention followed a citywide survey executed by GGGI, in partnership with the Ministry of Infrastructure and Rwanda Housing Authority, to assess the needs of its citizens regarding green and public spaces. The project will increase resilience and reduce the heat island effect, improving the microclimate and regulating temperatures, particularly in the dry season.<br><br>GGGI developed the guidelines and the design of the public space, which would be the first green public open space to obtain a construction permit in the city. The project secured its initial USD 250,000 from the Nyagatare District Mayor Office, which will serve as seed funding for scaling up this type of project across the country. | | | |
| 47 | Green Investment Advisory Support | Rwanda | 2019 | Sustainable Mobility | 0.9 |
| | | The project supported a public bike-sharing (PBS) company in launching a business in Kigali and two secondary cities, Rubavu and Musanze, located in the Western and Northern Provinces, respectively. GGGI conducted studies, surveys, and stakeholder consultations in Rubavu and Musanze to identify the challenges, limitations, and opportunities in adopting a PBS system and to specify key areas for potential docking stations and heavily used routes. GGGI linked the PBS company with district-level officials in the secondary cities and other key stakeholders to facilitate the launch of a PBS system.<br><br>Facilitated by GGGI's support, the firm has invested approximately USD 0.86 million in resources since the initiation of the PBS system operations. The company committed to providing GGGI with relevant data on users and rides for monitoring and evaluation and potentially for carbon credit applications. | | | |
| 48 | Greening the Mumbai-Nagpur Expressway, Utility-Scale 250MW Solar PV Project | India | 2020 | Solar | 145.0 |
| | | In 2018, leveraging GGGI's relationship with MSRDC management, GGGI formalized the partnership with MSRDC to support the greening of a 700 km large infrastructure project in Maharashtra. Though the partnership, GGGI led a detailed technical and financial feasibility analysis, which informed a proposal for a 250 MW solar PV plant along the 10 interchanges of the highway. Following applicable legal considerations, GGGI structured a transaction model proposing the establishment of an SPV to manage the financial flow and contractual arrangements with various stakeholders.<br><br>MSRDC is leading the implementation of this GGGI-designed project, and the MSRDC board has committed USD 40 million in equity. GGGI led the discussion with the Rural Electrification Corporation to secure a USD 110 million loan sanctioned based on a detailed project report and information memorandum. The expected longer-term impacts of this project over its 25-year lifetime are a reduction of 10 million $tCO_2e$ and around 200 new green jobs. | | | |
| 49 | Central Kalimantan Logging Concessions for Conservation Project | Indonesia | 2020 | Sustainable Landscape | 15.0 |
| | | The objective of the project was to develop projects within the private sector logging concessions in Kalimantan provinces to conserve the intact forested areas and thus prevent degradation of primary forest areas in Indonesia. The project has secured an investment commitment of USD 15 million from a private sector financier. GGGI led the feasibility study, which included cash flow modeling and a business case preparation of the project. GGGI also assisted by providing expertise on environmental and social assessments and technical analysis. | | | |
| 50 | Sustainable Coconut Sugar Production to Improve Livelihoods | Indonesia | 2020 | Sustainable Landscape | 8.0 |
| | | The aim of the project was to establish 1,200 hectares of a sustainable coconut plantation in Indonesia, integrated to an organic coconut sugar–producing facility that produces 15,000 tons of organic sugar per year. This intervention will increase farmers' income by at least three times that of an average coconut farmer, reduce the potential number of accidents during operations, and provide sustainable livelihood options for the communities, thereby reducing the degradation suffered in national parks. The project has secured an investment commitment of USD 8 million from Tropical Landscapes Finance Facility (TLFF).<br><br>GGGI carried out a joint preliminary assessment (through primary and secondary research) with TLFF for project site selection and provided financial and technical assistance, which included (i) establishment of the coconut facility, (ii) legal and institutional arrangements, and (iii) environmental and social safeguards analysis. | | | |
| 51 | Projects for GCF REDD+ Result Based Payment | Indonesia | 2020 | Sustainable Landscape | 103.8 |
| | | The project is based on Indonesia's REDD+ results for 2014–2016, with a total volume of 27 million $tCO_2e$ submitted to GCF for RBP and approved at the GCF 26th Board Meeting. Indonesia will use the proceeds from this RBP of USD 103.8 million to support the implementation of Indonesia's national REDD+ action strategy by strengthening the development, coordination, and implementation of Indonesia's overall forest governance and REDD+ architecture. The project will include activities, such as establishing FMUs and expanding implementation of the country's social forestry program. The project will lead to avoided emissions of 20 million $tCO_2e$.<br><br>GGGI prepared the Project Concept Note of the GCF REDD+ RBPs before the engagement of the AE. GGGI's technical inputs into the proposal included shaping the use of RBP proceeds, particularly for the NDC action plan and development of FMUs, and creating risks matrices, recommendations, and mitigation measures for safeguards. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 52 | Bataan 50MW Solar Farm Project | Philippines | 2020 | Solar | 45.0 |
| | | The project was designed to demonstrate solar PV development in Bataan, a province of Luzon Island, Philippines. The installed capacity is estimated to be 50 MW and is expected to reduce GHG emissions by 867,580 $tCO_2e$ by replacing existing coal and other fossil fuel sources.<br><br>GGGI partnered with the Provincial Government of Bataan in providing the land for the solar PV installation and an international private investor to prepare a detailed project development. With the partnership in place, GGGI conducted institutional market assessments, structured the initial business case, and provided needed technical assistance during the progress. Furthermore, GGGI actively supported private sector engagement, which led to an investment commitment of USD 45 million, a combination of USD 36 million from an international private investor and USD 9 million from the provincial government. | | | |
| 53 | Greening 400 telecommunication towers in Colombia | Colombia | 2020 | Solar | 32.0 |
| | | The aim of the project was to green telecommunication towers across Colombia with a 6 kWp photovoltaic solar system, a remote monitoring system, Li-ION battery storage, outdoor storage, and a backup power generator, with a CAPEX ranging from USD 60,000 to USD 80,000 per site. The designed solution was selected by Innova Capital Partners (ICP) and Golden Comunicaciones for deployment across 400 sites over the next four years, with an equivalent PV installed capacity of 2.4 MWp. This intervention is expected to provide greener and more sustainable energy solutions, bridge the digital divide, and expand infrastructure for rural and remote telecommunication tower sites.<br><br>GGGI, in collaboration with Innova Solar Colombia (ISC), worked toward the configuration and integration of green technological solutions for the energy supply of 1,400 telecommunication towers that mobile network operators expect to build over the next four years in rural and remote areas across Colombia. This joint study proposes a hybrid power system to reduce both operational expenditures and GHG emissions. A USD 32 million LoI was signed in September 2020 between ICP, GGGI, and ISC. The project is expected to avoid emissions of 88,850 $tCO_2e$ during its life. The construction of the systems has started, with 70 installations expected to be completed in 2021. | | | |
| 54 | Financing for Amazoniko's Greener Business Expansion | Colombia | 2020 | Sustainable Landscape | 2.0 |
| | | GGGI provided financial advisory support to Amazoniko (formerly, CorpoCampo), the largest producer of açai berries and heart palms in Colombia, to implement a USD 8 million fundraising plan for their expansion strategy with aims to bring 21,000 hectares under sustainable forest management, reforest 2,400 hectares of degraded land, and create 2,000 formal jobs. GGGI's financial advisory contributed to securing a USD 2 million loan with a seven-year maturity rate, a two-year grace period, and a 7% annual interest rate from the Common Fund for Commodities. However, at the time of the preparation of this report, due to COVID-19-related circumstances, Amazoniko has postponed the loan drawdown until corporate revenue returns to normal. | | | |
| 55 | Digestate Plant, Cali (Biogas and digestate from Cali vegetable markets) | Colombia | 2020 | Waste | 6.1 |
| | | The project was planned to develop the first organic waste-to-energy facility in Cali, Colombia. The facility will treat 20,000 tons of waste per year from central markets in the city and entails two main components, which are 1) biogas for the electric generation of 680 kWelec and 2) digestate for organic fertilizers. An LoI was secured from two private sector partners, with an investment commitment of USD 6.1 million.<br><br>GGGI supported the technical and financial feasibility analysis of the fertilizer production plant and agriculture fertilizer production. The technical project preparation activities included the physical-chemical characterization of organic waste (input) and digestate (output), biogas yield trials to determine the biogas potential from organic waste, and semi-continuous anaerobic digestion trials to produce digestate of a consistent quality. The financial feasibility analysis was conducted for a digestate and agriculture fertilizer market study and to assess and determine the steps for the final product to be certified as agriculture fertilizer in line with Colombia's laws and regulations. Currently, investors are finalizing the plant's detailed engineering design, which is expected to be completed by Q3 2021. | | | |
| 56 | Accelerating Solar on Island Resorts Program | Fiji | 2020 | Solar | 20.0 |
| | | The project was designed to support small and medium-sized off-grid hotels in Fiji by replacing diesel generators with solar PVs. The hotels are mainly located on Mamanuca and Yasawa Islands. Once implemented, the project is expected to reduce the high operating and maintenance costs that the hotels spend to run diesel generators. The project is a scale-up of a smaller pilot project of 1 MW which demonstrated investor interest in 2019. GGGI has played a central role since the pilot demonstration in designing the technical and financial scheme. The project was ultimately scaled up and GGGI mobilized USD 20 million from a renewable energy company in New Zealand. | | | |

| No. | Project Title | Country | Commitment Years | Theme | Initially Reported Total Value |
|---|---|---|---|---|---|
| 57 | Supporting Fiji State-owned Enterprise in Accessing Finance to Access Solar Energy | Fiji | 2020 | Solar | 3.6 |
| | | The project demonstrated a solar PV system on farmland located on the island of Vanua Levu, the second-largest island of Fiji. The installation site is planned to be approximately 30,000 $m^2$ with a low voltage and medium voltage transmission network available for the feed-in point, providing up to 3 MW. A food processing company that owns a processing factory near the site expressed interest in securing funds and implementing the project with an estimated USD 3.6 million. The company plans to sell power back to the grid under a PPA. GGGI undertook the feasibility assessments, including site explorations, estimation of the project size, and financial analysis. | | | |
| 58 | Greening 114 telecommunication towers for Vanuatu – a fuel switch project | Vanuatu | 2020 | Solar | 20.0 |
| | | The project was designed to green power systems for telecommunication towers in Vanuatu on 114 sites distributed across 17 Islands. Each site was analyzed based on load and power requirements, followed by an intensive optimization to lower the CAPEX and OPEX. Based on the study, different power mix options, including solar and battery options, were concluded as feasible, and the sites were aggregated to scale the project for investment as well as to see its overall impact in the country. The program is estimated to deliver fuel savings of 40%, mainly attributed to off-grid sites and a 50% reduction in $CO_2$ emissions from the existing diesel systems in operation.<br><br>GGGI's support in structuring the work plan resulted in a deal between an energy engineering consultancy and Digicel, the operator of the towers, on the project scope and deliverables with a commitment of USD 10 million. | | | |
| 59 | Low Carbon Buses for the Bus Rapid Transit System in Vientiane | Lao PDR | 2020 | Sustainable Mobility | 16.8 |
| | | The project aims to deploy 96 electric buses in Vientiane for the upcoming bus rapid transit system to replace the existing diesel-powered buses. Noise pollution, public health, and air quality would be improved through annual reductions of NOx by 61 tons and PM2.5 emissions by 491 kg. The investment size of the project is estimated to be USD 17 million, funded by the European Investment Bank.<br><br>GGGI, in tandem with Emergent Ventures International Pte Ltd., provided guidance for the Ministry of Public Works and Transport on the regulatory framework for electric vehicles and technical standards for the country. A study was produced that shows electric buses as the best low-carbon vehicle option for Lao PDR, with an internal rate of return of 30% for the additional costs of electric buses and associated infrastructure. | | | |

# REFERENCES


ADB, *ASEAN Catalytic Green Finance Facility 2019-2020. Accelerating Green Finance in Southeast Asia* (ADB: January 2021).

ADB, *Green, Sustainability, and Social Bonds for COVID-19 Recovery: A Thematic Bonds Primer* (ADB: February 2021).

Bielenberg, Aaron, Mike Kerlin, Jeremy Oppenheim, and Melissa Roberts, *Financing Change: How to Mobilize Private Sector Financing for Sustainable Infrastructure* (Mckinsey & Company: 2016).

CBI, *Green Infrastructure Investment Opportunities: Viet Nam 2019 Report* (CBI: 2019).

Delmon, J. *Private Sector Investment in Infrastructure: Project Finance, PPP Projects and PPP Frameworks* (Alphen an den Rijn: Wolters Kluwer, 2016).

Credit Suisse, WWF, and McKinsey & Company, *Conservation Finance: Moving Beyond Donor Funding Toward an Investor-Driven Approach* (January 2014).

DFI Working Group on Blended Concessional Finance for Private Sector Projects – *Summary Report* (DFI: October 2017).

DFI Working Group on Blended Concessional Finance for Private Sector Projects. *Joint Report* (DFI: October 2018).

Forum for the Future and EnviroMarket, *Forest Backed Bonds: Proof of Concept Study* (August 2007).

GGGI, *Bridging the Policy and Investment Gap for Payment for Ecosystem Services: Learning from Costa Rican Experience and Roads Ahead* (GGGI: 2016).

GGGI Insight Brief 1, *Mind the Gap: Bridging the Climate Financing Gap with Innovative Financial Mechanisms* (GGGI: 2016).

GGGI, *Discussion Paper on Nationally Determined Contributions (NDCs) and National Financing Vehicles (NFVs).* GGGI Submission to Council September 2016.

GGGI, *Refreshed Strategic Plan 2015-2020* (GGGI: 2017).

GGGI, *Closing the Financing Gap: Understanding "Bankability," Risks and How GGGI Supports Countries to Access Green Finance.* GGGI Submission to Council January 2018.

GGGI, *Deploying Electric Buses in the Kathmandu Valley: A Pre-Feasibility Study* (GGGI: 2018).

GGGI Main Evaluation Report, *Evaluation of GGGI's Green Investment Services* (GGGI: December 2019).

GGGI, *GGGI Strategy 2030* (GGGI, 2019).

GGGI Technical Report No. 9, *Review of GGGI's Experience to Design and Operationalize National Financing Vehicles to Finance Climate and Green Growth Policy Implementation* (GGGI: December 2019).

GGGI, *Green Bonds Make More Cents? International Experiences and Policy Implications for Viet Nam* (GGGI: June 2021).

GGGI, *Going Green: Technical and Investment Analytics for Sajha Yatayat's First Electric Bus Fleet* (GGGI: January 2020).

GGGI, *Roadmap to Implement Strategy 2030.* GGGI Submission to Management and Program Sub-Committee (GGGI: May 2020).

GGGI, *Work Program and Budget 2021-2022* (GGGI: October 2020).

GGGI, *Landscape Analysis Report to Scale up the Installation of Solar Irrigation Businesses in Senegal* (GGGI, January 2021).

GGGI, *Compendium of Practices in Climate Smart Agriculture and Solar Irrigation* (GGGI: March 2021).

Global Commission on Adaptation, *Adapt Now: A Global Call for Leadership on Climate Resilience* (Global Center on Adaptation and World Resources Institute: 2019).

IADB, Connecting and Developing Markets. Environmental Finance (IADB: February 2021).

IFC, *Using Blended Concessional Finance to Invest in Challenging Markets: Economic Considerations, Transparency, Governance, and Lessons of Experience* (Washington DC: IFC 2021).

IFC, *Transformation. IFC Annual Report 2020* (Washington DC: IFC, 2021).
Klein, Michael, *Public-Private Partnerships: Promise and Hype*. World Bank Group Policy Research Working Paper, No. 7340 (Washington, DC: World Bank Group, June 2015).
Lamech, Ranjit and Kazim Saeed, *What International Investors Look For When Investing In Developing Countries: Results from a Survey of International Investors in the Power Sector* (Washington, DC: World Bank Group, 2003).
Little, I.M.D. and J.A. Mirrless, *Project Appraisal and Planning for Developing Countries* (New York: Basic Books, 1974).
Nassiry, Darius and Smita Nakhooda, with Sam Barnard, *Finding the Pipeline: Project Preparation for Sustainable Infrastructure* (ODI: November 2016).
OECD/UNCDF (2020), *Blended Finance in the Least Developed Countries 2020: Supporting a Resilient COVID-19 Recovery* (Paris: OECD Publishing, 2020).
Redlinger, R. Y., P. D. Andersen and P.E. Morthorst, *Wind Energy in the 21st Century* (New York: Palgrave, 2002)
West African Development Bank (BOAD), *The West African Development Bank (BOAD) issues the first African sustainability bond.* https://www.BOAD.en/the-west-african-development-bank-boad-issues-the-first-african-sustainability-bond (BOAD: January 2021).

## ABOUT THE GLOBAL GREEN GROWTH INSTITUTE

GGGI was established as an international intergovernmental organization in 2012 at the Rio+20 United Nations Conference on Sustainable Development. Its vision is “a low-carbon, resilient world of strong, inclusive, and sustainable growth” and its mission “to support Members in the transformation of their economies into a green growth economic model”. GGGI does this through technical assistance to: reduce greenhouse gas emissions in line with the Paris Agreement; create green jobs; increase access to sustainable services (such as clean affordable energy, sustainable waste management); improve air quality; sustain natural capital for adequate supply of ecosystem services; and enhance adaptation to climate change.

Mr. Ban Ki-moon is the President of the Assembly and Chair of the Council of GGGI. Membership to GGGI is open to Member States of the United Nations and Regional Integration Organizations ratify the Agreement on the Establishment of GGGI. The Members of GGGI are Angola, Australia, Burkina Faso, Cambodia, Colombia, Costa Rica, Côte d’Ivoire, Denmark, Ecuador, Ethiopia, Fiji, Guyana, Hungary, Indonesia, Jordan, Kiribati, Kyrgyz Republic, Lao PDR, Mexico, Mongolia, Norway, Organisation of Eastern Caribbean States, Papua New Guinea, Paraguay, Peru, Philippines, Qatar, Republic of Korea, Rwanda, Senegal, Sri Lanka, Thailand, Tonga, United Arab Emirates, Uganda, United Kingdom, Uzbekistan, Vanuatu, Viet Nam.

Follow our activities on
Facebook and Twitter

www. gggi.org