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Consideration of funding proposals – Addendum XXVIII

Independent Technical Advisory Panel's assessment

Summary

This addendum contains the independent Technical Advisory Panel's assessments of funding proposals (FP082-FP099) submitted for the Board's consideration at its twenty-first meeting.

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Independent Technical Advisory Panel's assessment of FP082

Proposal name:	Catalyzing Climate Finance (Shandong Green Development Fund)
Accredited entity:	Asian Development Bank (ADB)
Project/programme size:	Large

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: Medium/High*

1. China is currently the world's second largest economy, following the United States of America, and has a population of 1.3 billion. It is also the largest developing country and carbon emitter (2016), releasing just under a third of global emissions in 2016. Nearly three-quarters (73 per cent) of the growth in global carbon emissions between 2010 and 2012 occurred in China. China is also ranked as the twelfth most affected country by extreme weather events with financial losses amounting to USD 82 billion in 2016.

2. Under the thirteenth Five-Year Plan (2016-2020), the Government of China promotes a shift from development that is oriented towards increasing gross domestic product (GDP) to a development model centred on quality of growth. It has launched several strategic initiatives on climate change that build the foundations for strong supporting policies and regulatory frameworks. The central government has determined regional low-carbon development as an important way to control greenhouse gas (GHG) emissions. Accordingly, all provinces incorporate the carbon-intensity reduction goal into their economic and social development plans and annual plans.

3. Shandong is a coastal province of China and part of the East China region. It is ranked eighth in terms of provincial GDP per capita and has a large population of 99.47 million (2016). Shandong has the third largest provincial economy and therefore plays a critical role in overall national GDP. However, the Shandong tops the country's energy consumption and number of vehicles, and it is responsible for the large portion of the GHG emissions in the country. Climate vulnerability is recognized as a limiting factor for growth at the core of the water–food–energy nexus in Shandong.

4. Shandong is now required by the government to reduce its carbon dioxide (CO_2) emission intensity by 20.5 per cent by 2020. This is the largest reduction to be set at the provincial level in China. To achieve this target, Shandong requires significant investments in mitigation from energy, urban activities and industrial transformation and adaptation from water resources, agriculture, and coastal and ecologically vulnerable areas. Shandong aims to peak its CO_2 emissions around 2027, three years earlier than the national goal under the intended nationally determined contribution.

5. The programme, proposed by the accredited entity (AE), the Asian Development Bank (ADB), aims to mobilize USD 1.5 billion for the Shandong Green Development Fund (SGDF) to catalyse climate finance for a portfolio of climate subprojects in Shandong (Component 1). It is proposed to mobilize the funding from international financial institutions (IFIs) against sovereign guarantee (USD 484 million: 32 per cent; Shandong provincial and local governments

(USD 375 million: 25 per cent); private, institutional, and commercial (PIC) investors (USD 626 million: 42 per cent); and the SGDF Fund Management Company (USD 15 million: 1 per cent). The IFIs include GCF (USD 180 million), the AE (USD 100 million), Kreditanstalt für Wiederaufbau (EUR 100 million), and Agence Française de Development (EUR 75 million). The PIC funds will be mobilized and invested in SGDF and subprojects over multiple closings during the 20-year duration of SGDF.

6. SGDF will be managed by the SGDF Fund Management Company, a fund manager, to be created and invested equally by the Shandong Development Investment Holdings Group (SDIHG), a state-owned enterprise wholly owned by the Shandong Provincial Government, and a private sector entity to be selected. SGDF will finance a portion of the total capital expenditures of selected climate mitigation and adaptation subprojects in the form of equity and/or debt.

7. In addition, USD 10 million for technical assistance (TA), funded by the AE, is proposed (Components 2, 3 and 4): TA for design and financial structuring support (Component 2: USD 3.5 million); TA for training, green rating and a monitoring and evaluation system (Component 3: USD 6.4 million); and TA for policy seminars (Component 4: USD 0.1 million). The AE will seek additional donor funds to enhance the TA programme in 2019.

8. The asset allocation of SGDF under Component 1 will consist of direct investment in climate resilient infrastructure subprojects; green and high technology manufacturing businesses (80 per cent); and climate sub-funds for specific municipalities or sectors (20 per cent). The climate sub-funds will include municipal funds and sectoral funds. With respect to distribution between mitigation and adaptation, it is estimated to be of the ratio of 75:25.\

9. The AE estimates that expected mitigation benefits after the fifth year of SGDF operation will deliver GHG emission reductions of 2 million tonnes of carbon dioxide equivalent (tCO_2eq) annually, and 50 million to 75 million tCO_2eq over the 20-year tenor of SGDF. The estimation the AE has prepared is based on 10 subprojects that SGDF is currently considering, including three subprojects with preliminary feasibility studies and another three subprojects with basic CO_2 reduction data.

10. The AE further estimates that adaptation benefits include 10 million direct beneficiaries, or 10 per cent of Shandong's population. The number of indirect beneficiaries is estimated at 25 million, of which 50 per cent are women.

11. The mitigation impact estimations prepared by the AE are based on sample subprojects being considered by SGDF. However, the adaptation impact estimations are prepared based on the number of people at risk from adverse effects in Shandong. No candidate subprojects to be based on the adaptation impact estimations have been identified. The impacts are to be realized during the 20-year tenor of SGDF so uncertainty remains.

12. Accordingly, the independent Technical Advisory Panel (TAP) views impact potential of the proposed programme as "Medium/High".

1.2 Paradigm shift potential *Scale: Medium*

Potential for scaling up

13. The Chinese Academy for Environmental Planning estimates environmental investment at around 17 billion Chinese yuan (CNY) (USD 2.7 billion) under the thirteenth Five-Year Plan (2015–2020). Given the very large investment required, new mechanisms are being sought to mobilize financing especially from the PIC sector for climate investments.

14. In Shandong, PIC financing is generally available in the form of debt-for-infrastructure projects developed through public-private partnerships (PPP). Climate change projects or climate change aspects of infrastructure projects are not regarded as priority or essential by PIC investors in their investments. Traditional government finance and bank commercial funding do not cater for the needs of climate change projects with longer maturity, flexible terms and competitive interest rates.

15. The proposed programme aims to establish a mechanism to mobilize and channel funding from PIC investors to promote climate change mitigation and adaptation interventions that would otherwise rely on long-term government funding or would not proceed due to a shortage of public funding or perceived high risk. The SGDF is expected to be a model that can be replicated beyond Shandong, in other priority provinces and then at the national level.

16. However, the funding proposal does not include a study of the financial market identifying and assessing the bottlenecks and constraints that prevent PIC investors from financing climate mitigation or adaptation projects in Shandong.

Contribution to the regulatory framework and policies

17. The SGDF will be managed by SDIHG, the investment vehicle of the Shandong Provincial Government. The SDIHG Board includes a representative from the Development and Reform Commission of Shandong Province. Findings and lessons learned from SGDF investments in climate change projects can be directly transmitted by the representative to the provincial government policy-making process, and disseminated to other provinces in China.

Potential for knowledge and learning

18. The TA provided by the AE includes a project preparation facility (Component 2). This provides support to project sponsors to upgrade their project design using advanced and appropriate technologies and processes that can further enhance the project's climate impacts and fulfil GCF climate investment criteria.

19. The Project Preparation Facility will be used on a reimbursable basis. Since the cost will be recovered subsequently as part of a subproject loan, the facility can be sustainable over the long term.

20. The TA includes Component 4, which focuses on support to capacity-development through the dissemination of knowledge and experience gained through SGDF investments.

21. The AE intends to promote a similar concept to SGDF in other developing member countries in Asia and the Pacific through its Green Finance Catalyzing Facility, following the implementation of SGDF. Dissemination of the lessons learned from the proposed programme design and implementation is secured through the knowledge action plan of the AE and the co-financiers.

22. The proposed programme has potential for scaling up and contributing to the regulatory framework and polices not only at provincial level but also at the national level in China. Findings and lessons learned generated through the SGDF operation will be disseminated by the AE in its work in the region. Accordingly, the independent TAP considers the paradigm shift potential of the proposed programme as “Medium/High”.

1.3 Sustainable development potential *Scale: Medium/High*

Environmental co-benefits

23. Environmental co-benefits include improved quality of air, water and soil as well as improved biodiversity. The AE estimates that the GHG reduction of 50 million tCO_2eq will

displace around 19 million t of coal, resulting in the reduction of 162,213 t of nitrogen oxide and 141,221 t of sulpher oxide.

Social co-benefits

24. It is expected that the programme will directly benefit about 10 million people in Shandong and indirectly benefit about 25 million from neighbouring provinces.

Economic co-benefits

25. The programme will directly create new employment opportunities and improve local economic development in Shandong.

Gender-sensitive development impact

26. The gender policy of the AE promotes more effective projects to support the proactive involvement of women in project planning and implementation and to ensure gender mainstreaming. The proposed programme includes technical assistance that will finance knowledge products, workshops, community outreach and specific education programmes.

27. Investments under the programme contribute to several Sustainable Development Goals (SDGs):

(a) SDG 9 "Industry, Innovation and Infrastructure" building climate resilient infrastructure and fostering innovative climate finance models;

(b) SDG 11 "Sustainable Cities and Communities" making cities and communities more resilient, safe, inclusive and sustainable; and

(c) SDG 13 "Climate Action" taking urgent action to promote climate related investments to combat the impacts of climate change. In particular, the programme fosters a strategy of low-carbon infrastructure and industrial development, addressing the challenges posed by rapid urbanization, and scaling up action to meet the more ambitious goals of ecological civilization.

28. The independent TAP considers the sustainable development potential of the proposed programme as "Medium/High".

1.4 Needs of the recipient *Scale: Medium/High*

Vulnerability of the country

29. China is ranked as the twelfth country most affected by extreme weather events, with financial losses amounting to USD 82 billion in 2016.

30. The "Implementation Plan for Shandong Province for Addressing Climate Change" (2009) identified key climate change impacts observed in Shandong, such as an increase in temperature and precipitation.

Absence of alternative sources of funding

31. The proposed programme aims to develop a new financing mechanism effective for climate finance by mobilizing funding from the PIC sector in China. SGDF will act as a catalyst for local climate finance in capital markets. It provides new instruments and new funding sources for climate finance.

32. The AE believes that GCF participation in SGDF is essential to mobilize a large amount of financing from the PIC sector as it is regarded as providing international recognition of SGDF

objectives and operations in climate change mitigation and adaptation in Shandong, and more broadly in China.

33. The proposed GCF assistance of USD 180 million will be in the form of a concessional loan for a tenor of 20 years against sovereign obligations. The concessionality of the GCF loan will be passed on to SGDF and ultimately to subprojects.

34. The independent TAP agrees that the needs of the recipient of the proposed programme are "Medium/High".

1.5 Country ownership *Scale: High*

Existence of a national climate strategy and coherence with existing plans and policies

35. China's intended nationally determined contribution details its commitment to achieveing certain climate change actions by 2030 including: to reach peak CO_2 emissions around 2030 while making efforts to peak even earlier; to lower CO_2 emissions per unit of GDP by 60-65 per cent from the 2005 level; to increase the share of non-fossil fuels in primary energy consumption to around 20 per cent; to increase the forest stock volume by around 4.5 billion m^3 over 2005 levels; to proactively adapt to climate change by enhancing mechanisms and capacities to effectively defend against climate change risks in key areas such as agriculture, forestry and water resources as well as in urban, coastal, and ecologically vulnerable areas; and to progressively strengthen early warning and emergency response systems and disaster prevention and reduction mechanisms.

36. The "13th Five-Year Plan for Controlling Greenhouse Gas Emissions" includes specific tasks to control GHG emissions by 2020 in China and sets forth intermediary measurable emission control goals that are binding at the provincial and local government levels.

37. The "National Plan for Combating Climate Change" (2014–2020) states that addressing climate change is a major national strategy and requires that mitigation and adaptation tools and strategies are integrated in the country's economic and social development.

38. "The Low Carbon Development Work Plan of Shandong Province (2017–2020)" is a plan to reduce CO_2 emissions and meet the carbon intensity goal in Shandong. The plan proposes that the carbon emissions per unit area of GDP will decrease by 20.5 per cent from the 2015 level by 2020. Shandong also sets the goal for CO_2 emissions to peak around 2027, earlier than the national goal of around 2030.

39. The proposed programme is in line with the climate strategy and plans of China and Shandong.

Capacity of accredited entities and executing entities to deliver

40. ADB, the AE, commenced its cooperation with and operation in China 32 years ago. ADB provided comprehensive policy advice for the implementation of critical reforms, specifically, assisting with the preparation of the eleventh, twelfth, and thirteenth Five-Year Plans.

41. From 2011 to 2016, the AE provided USD 2.88 billion in climate financing from its own resources to China, of which mitigation financing constituted USD 2.07 billion. This represented 17 per cent of the total climate financing from the AE for the period. Estimates for 2017 show that out of USD 4.5 billion in total climate financing, the AE invested USD 1.1 billion to mitigate GHG emission reductions in China. Climate related subprojects funded by the AE in the China energy sector in 2017 alone will result in annual GHG emission reductions of 12 million tCO_2eq.

42. The SDIHG is the co-executing entity (EE) mandated by the Shandong Provincial Government to set up SGDF. SDIHG is a wholly state-owned enterprise (40 per cent: Shandong

Provincial Development and Reform Commission; 30 per cent: State-Owned Assets Supervision and Administration Commission of Shandong Province; 30 per cent: Shandong Provincial Social Security and Pension Funds). All IFI sovereign guaranteed loans, including that of GCF, will be onlent by the Ministry of Finance, which is also the national designated authority (NDA), to the Shandong Provincial Government, and then to SDIHG.

43. SDIHG operates to support infrastructure development and to implement the provincial government's industrial transformation policies. Its business scope includes investment and management, capital operation, asset management, trusteeship, and investment advisory services. SDIHG currently has 100 employees.

44. As of 2017, SDIHG has 17 subsidiaries with ownership ranging between 40 per cent and 100 per cent. The subsidiaries are mainly involved in investment, trusteeship and advisory business, with some in creative industries, electronic technology and training. In 2017, the company recorded a net profit of CNY 289 million based on total assets of CNY 20.7 billion, total liabilities of CNY 5.3 billion, and total equity of CNY 15.4 billion. The SDIHG has directly invested in diversified sectors, including railways, power, airports, airlines, green buildings, petrochemicals, and culture and media, among others.

45. SDIHG appears to have financial and operational capacity to finance infrastructure transactions in Shandong. However, its capacity still needs to be developed to successfully discharge its EE function for the proposed programme. The TA of the AE can be effective to strengthen EE capacity in this regard.

Engagement with national designated authorities, civil society organizations and other relevant stakeholders

46. The AE has discussed the SGDF concept and processing schedule with the EE and NDA. The concept note endorsed by the Secretariat was shared with the NDA. The programme is included in the "Country Operations Business Plan 2017–2019" of ADB and is confirmed in the "Country Operations Business Plan 2018–2020" for 2018 with co-financing.

47. The NDA, in its capacity as Ministry of Finance, agreed to issue a sovereign guarantee to loans to be provided by IFIs, including GCF.

48. The AE interviewed financial institutions in the commercial banking sector, insurance industry and social pension funds for their possible participation in SGDF. The SDIHG is conducting market surveys to assess market demand, appetite from PIC investors and modalities for investment.

49. A no-objection letter issued by the NDA is attached to the funding proposal.

50. The independent TAP considers that country ownership is "High".

1.6 Efficiency and effectiveness *Scale: Medium/High*

Cost-effectiveness and efficiency regarding financial and non-financial aspects

51. The AE projects that lifetime emission reductions during the 20-year tenor of SGDF will reach 50,000 tCO_2eq. Accordingly, the estimated cost per tCO_2eq is USD 30 per tCO_2eq, and the estimated GCF cost per tCO_2eq removed is USD 3.0 per tCO_2eq.

Amount of co-financing

52. The GCF co-financing ratio is estimated to reach 1:4.4 at the onset of SGDF, with the contribution of other IFIs, the provincial government and general partners. If the subsequent contribution of PICs is taken into account, the ratio will reach 1:8.8. Therefore the co-financing

ratio, taking into account total funding mobilized at the SGDF and subproject level, can be high although it takes place over a long period of time (20 years).

Programme/project financial viability and other financial indicators

53. In screening potential subprojects, SGDF applies both financial and non-financial criteria. The financial criteria include the estimated subproject investment and operations costs, as well as cash inflows. Only subprojects, which are commercially viable and exceed predetermined financial and economic hurdle rates, can be considered by SGDF.

54. A financial model attached to the funding proposal shows that SGDF will be able to provide an average financial return of 6.7 per cent. The financial internal rate of returns for private and public sector investors are projected to be 9.1 per cent and 3.6 per cent. The return to the investors over 6 per cent does not include an assessment of SGDF financial sustainability in the long run.

55. As per the projection prepared by the AE, SGDF is financially viable and sustainable.

Industry best practices

56. SGDF promotes the use of SOURCE. This innovative information technology platform was developed by the AE and is a joint initiative from multilateral development banks to improve project design and speed up the development of sustainable infrastructure projects. It is designed to help public sector agencies prepare, manage and publish their infrastructure projects and to attract private sector investment. The Sustainable Infrastructure Foundation, a not-for-profit Swiss Foundation headquartered in Geneva, operates and coordinates the provision of SOURCE in conjunction with multilateral development banks.

57. Green procurement will be adopted by SGDF based on European standards. It will be customized to meet China's needs for SGDF operation. The green procurement system in place allows the greening of the supply chain for manufacturing businesses and infrastructure projects.

58. The efficiency and effectiveness of the proposed programme can be significant. It is projected to have a competitive emission reduction cost of USD 30 per tCO_2eq and a GCF cost of USD 3.0 per tCO_2eq. The co-financing ratio is expected to be as high as 1:8.8 for the GCF contribution. However, the estimated efficiency can be achieved during the 20-year tenor of SGDF, so uncertainty remains. Accordingly, the independent TAP considers the efficiency and effectiveness of the proposed programme as "Medium/High".

II. Overall remarks from the independent Technical Advisory Panel

59. The independent TAP recommends the Board to consider the proposed programme with the following condition:

(a) Prior to first disbursement, the AE will present for Secretariat review and approval an operation manual to be used by SGDF in its assessment and monitoring of subprojects. The manual should contain, among others:

  (i) Financial and non-financial indicators and criteria as described in annexes 9 and 14 of the funding proposal, with further elaboration of their application;

  (ii) Monitoring, evaluation and reporting structure and process expanded to include details based on annex 11 of the funding proposal;

  (iii) Subproject screening and an investment decision-making process; and

(iv) A pricing policy based on project risks but taking into account climate change impact potential and green procurement.

60. SDIHG capacity needs to be developed to successfully discharge its EE function for the proposed programme. The TA of the AE can be effective to strengthen EE capacity in this regard. The operational manual will ensure SDIHG to establish internally an effective and consistent assessment and approval process of climate change subprojects.

Independent Technical Advisory Panel's assessment of FP083

Proposal name:	Indonesia Geothermal Resource Risk Mitigation Project
Proposal number:	World Bank
Project/programme size:	Large

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: Medium*

Adaptation impact

1. Indonesia is ranked as the largest economy in South-East Asia and the world's eighth largest. With over 260 million people, it is also the world's fourth most populous nation. With its abundant natural resources, the country is one of the world's largest producers and exporters of coal. The coal reserves of Indonesia rank ninth in the world, containing about 2.2 per cent of total proven global coal reserves. They are estimated to last around 83 years if the current rate of production is to be continued.

2. The nation's grid is dominated by fossil-fuelled generation. Its electricity generation mix is coal 58.3 per cent, gas 23.2 per cent, diesel 6 per cent and renewable energy 12.5 per cent. The total installed power generation capacity in Indonesia is estimated at 55 GW in 2017. To achieve a national electrification rate of 99.7 per cent, the Government of Indonesia (GOI) plans to add approximately 78 GW capacity by 2025, comprising 31.9 GW coal, 24.4 GW gas, 14.1 GW hydropower, 5.8 GW geothermal and 1.2 GW other renewable sources. As per the plan, the generation mix of Indonesia by 2027 would be 54.4 per cent coal, 22.2 per cent gas, 0.4 per cent diesel and 23 per cent renewable energy. Although the share of renewable energy is expected to increase, fossil-fuelled generation will remain dominant in the power generation mix of the country.

3. In the GOI plan, geothermal generation capacity would increase from 1.8 GW to 7.6 GW. Indonesia's geothermal power potential is estimated at around 29 GW, roughly 40 per cent of the world's known reserves. Despite this tremendous potential, only 1.8 GW, or about 6 per cent, of geothermal resources in Indonesia has been developed to produce power because of the high resource risk coupled with high drilling costs.

4. The proposed mitigation project aims to establish a new Geothermal Resource Risk Mitigation Facility (GREM) to mitigate the resource risk and financing cost that developers assume for exploring geothermal resources in areas identified as high potential in Indonesia.

5. The project has two components. Component 1 offers financing of USD 650 million for geothermal resource risk mitigation for both public sector entities (public sector window: USD 200 million) and private sector entities (private sector window: USD 450 million).

6. Funding for public sector developers will be provided by the World Bank, the accredited entity (AE) (USD 25 million) and GCF (USD 25 million) in the form of a senior loan against sovereign guarantee. An additional USD 150 million will be provided by PT Sarana Multi Infrastuktur (PT SMI)/Infrastructure Fund for Geothermal Sector (PISP). PISP is a programme established by the GOI and managed by PT SMI to support geothermal investment.

7. Financial assistance for the private sector developers will be provided by the AE (USD 300 million) in the form of a senior loan against sovereign guarantee, and by GCF (USD 150 million) in the form of a reimbursable grant.

8. It is expected that an additional USD 100 million will be mobilized under Component 1 from private sector developers in the form of an equity contribution to the drilling subprojects as per the requirement that private sector developers should provide at least 25 per cent of drilling costs.

9. The GCF financial assistance under Component 1 will be provided in two tranches. A USD 25 million senior loan for the public sector window will be spilt into USD 7.5 million, and USD 17.5 million. The reimbursable grant of USD 150 million for the private sector window will be split into USD 90 million, and USD 60 million. The GCF commitment on the reimbursable grant has a tenor of 10 years and 20 years on the sovereign loan, including a 4-year commitment period with GCF commitment to the second tranche being subject to a separate approval by the GCF Board.

10. Component 2 relates to technical assistance with two sub-components to be funded solely with a USD 10 million grant from GCF. The first sub-component (USD 2.5 million) aims to support a multi-year capacity-building programme to develop and manage the portfolio of drilling subprojects assisted by GREM under Component 1.

11. The second sub-component (USD 7.5 million) will be provided to public sector stakeholders, including the Ministry of Energy and Mineral Resources (MEMR), PT Perusahaan Listrik Negara (PLN), the state electricity company of Indonesia. and PT Geo Dipe Energi, a state-owned company specializing in geothermal energy, for the enhancement of the sector governance and promotion of investment climate for geothermal development in Indonesia.

12. With the implementation of GREM, the AE estimates that 1,000–1,500 MW of additional geothermal resources can be realized in Indonesia. The estimation takes into account the development success rate of 75 per cent. As is confirmed by the AE, the estimation is reasonable given the track record in Indonesia of 60–75 per cent. Otherwise, the rate might be considered high.

13. With a 92 per cent plant factor assumed based on the track record of other geothermal plants in Indonesia, GREM will contribute to generating 8,059 GWh of renewable energy per year for the economic life of 30 years.

14. Applying a grid factor of 838 grams (g) carbon dioxide equivalent (CO_2eq)/ kWh based on the country energy mix and an average emission factor for geothermal energy facilities of 62.9 tCO2eq/GWh, it is projected to achieve the net reduction in greenhouse gas (GHG) emissions of 6.2 MtCO_2eq annually or 187 MtCO_2eq for 30 years. The projection includes emissions from the drilling phase and deforestation as a result of drilling activities.

15. The project's impact potential in the long term is notable. However, it is dependent on subsequent implementation of geothermal power generation plants following successful exploration drilling funded by GREM. The projected impact cannot be considered as a result solely from the proposed project as this would mean the risk of double counting is unavoidable. Accordingly, the independent Technical Advisory Panel (TAP) scales the project impact potential as "Medium".

1.2 Paradigm shift potential *Scale: High*

16. Through the public sector window, GREM will offer public sector developers (state-owned enterprises (SOEs), SOE subsidiaries and public service agencies) concessional loans for resource confirmation drilling. The loans are funded by the AE, GCF and PISP at a ratio of 1 to 1 and capped at USD 30 million per subproject.

17. Financial assistance from GREM for private sector entities will have two modalities: a standard loan financed from the proceeds of the sovereign guaranteed loan of the AE (USD 300 million), and subscription by PT SMI of convertible bonds issued through a special purpose vehicle established by private sector developers to undertake the subprojects. The latter will be financed in entirety from GCF reimbursable grant (USD 150 million). A USD 30 million cap is also applied for each private sector subproject.

18. The convertible bond is structured in such a way that a private sector developer pays back PT SMI a fair value of the drilling subproject at the time of repayment. This will entitle PT SMI to receive upside financial returns in the case of a successful drilling result as a fair value of the bond becomes higher than the original bond value. However, the private sector developers are protected from downside loss (up to 25 per cent equity investment) in the case of an unsuccessful drilling result since a fair value of bond will be residual and lower than the original bond value.

19. The convertible bond will be issued for PT SMI subscription with a tenor of 6 years by a special purpose vehicle established by private sector developers when undertaking a subproject. To ensure that repayment can be made, and fund reflows can be captured during the 10-year tenor of GCF assistance, no issuance/subscription will take place after year 4 of project implementation.

20. The GREM loan can finance exploration, or exploration and delineation, depending on the size of the subproject, but only in 67 geothermal working areas designated by the GOI.[1] GCF assistance is available only to finance exploration.

21. The convertible bond structure is innovative in mitigating and sharing the resource risk of geothermal exploration with private sector developers. The proposed project presents a risk mitigation model with potential to be replicated in other countries and regions with geothermal resources.

22. Offering attractive financing and risk mitigation to drilling programmes in Indonesia as a package, the project enhances government commitment and involvement in a more holistic and systematic manner in geothermal resource development vis-à-vis a well-based guarantee programme.

Contribution to the creation of an enabling environment

23. By mitigating the risk associated with exploration drilling and providing innovative financing, GREM can enhance the appetite of geothermal developers and expand their participation in geothermal power generation. Technical assistance and capacity-building support for key GOI stakeholders, including MEMR, the Ministry of Finance (MOF, also the national designated authority), and PT PLN, in Component 2 will help create an enabling environment to further promote development of the geothermal sector in Indonesia.

Contribution to regulatory framework and policies

24. While the GOI has endeavoured to strengthen the national and local regulatory frameworks to systematically drive investment to the geothermal sector, its results are

[1] As per the draft operation manual attached, the Ministry of Energy and Mineral Resources has identified 71 geothermal working areas to be developed over the next seven years.

mixed. With technical assistance under Component 2, remaining bottlenecks can be identified and specific interventions will be recommended to strengthen the legal framework and regulatory environment for the geothermal sector in the long term.

Potential for knowledge and learning

25. The proposed project will enhance knowledge and capacity of the geothermal sector in Indonesia by involving and promoting dialogues among key stakeholders in the sector such as MEMR, MOF, PT SMI, PT PLN, and public and private developers.

26. Technical assistance under Component 2 assists the GOI in attracting technically qualified and financially solid private investors and developers to participate in geothermal resource and power development in Indonesia. It further provides government stakeholders with the technical and legal advisory essential for the contract management and subproject supervision.

27. The independent TAP views the risk mitigation model to be established by GREM innovative and having potential for replication. Component 2 is expected to assist key stakeholders in enhancing dialogues and establishing regulatory and policy frameworks more conducive to subsequent development of the geothermal power capacity in Indonesia. The independent TAP rates the project paradigm shift potential as "High".

1.3 Sustainable development potential *Scale: Medium/High*

28. The GREM will assist GOI in accelerating its power development in a sustainable manner with base-load renewable energy generation in the form of geothermal power. Since it is not affected by price fluctuations and delivery of fuels, geothermal energy provides cost-competitive and reliable renewable electricity to Indonesia. It will contribute to the PT PLN plan to increase the national electrification rate from a current rate of 93 per cent to 99.7 per cent by 2025.

29. Activities to be financed by GREM will create direct jobs for both skilled and manual workers engaged in drilling, civil works, and infrastructure construction and auxiliary services in up to 20 locations throughout Indonesia. According to the Geothermal Energy Association, a typical 50 MW geothermal project could generate employment for approximately 860 people with diverse skills over its full development cycle. If geothermal power generation plants are developed subsequent to GREM, then further employment can be generated during the construction and operation of plants. The project contributes to increase electrification and generates jobs where electrification is low and poverty rates are high as geothermal resources can also be found on islands in remote regions.

30. The GREM promotes private sector participation in an area that is currently considered of high investment risk by private sector investors. With GREM, the AE expects additional power generation capacity of 1,000–1,500 MW to be developed with a USD 100 million private capital mobilized for geothermal exploration and subsequently USD 3.5 billion investment in geothermal power generation.

31. The project's direct economic and social co-benefits relating to exploration drilling are limited and short term. However, the benefits can be magnified if geothermal power generation facilities are constructed and operated subsequent to successful exploration drilling assisted by GREM. Accordingly, the independent TAP views the sustainable development potential of the project as "Medium/High".

1.4 Needs of the recipient *Scale: High*

32. In its nationally determined contribution (NDC), the GOI committed to reduce GHG emissions by 29 per cent by increasing the share of renewable energy in the power generation mix from 7 to 23 per cent. Indonesia's geothermal power potential is estimated at around 29 GW, roughly 40 per cent of the world's known reserves. Despite this tremendous potential, only 1.8 GW, or about 6 per cent, of geothermal resources in Indonesia has been developed. GREM aims to promote development of 1,000–1,500 MW of geothermal power generation critically needed for GOI to increase the share of renewable energy in the power generation to 23 per cent by 2027.

33. Private sector investment in geothermal power generation has been hindered owing to limited investment available in exploration drilling in Indonesia. The GREM will mitigate geothermal resource risk that developers have been reluctant to assume and thereby promote private sector investment in the sector. According to the market sounding performed by the AE, private developers are interested in exploring investment opportunities in geothermal resource exploration and subsequent power generation by availing themselves of GREM financial assistances.

34. The financial assessment of the AE confirms that, with the project, public and private developers are able to achieve or exceed the required return on investment for 55 MW geothermal power plants. Private investors may find investment in 10 MW geothermal power plants unattractive, however. Without the proposed project, neither the larger 55 MW nor the smaller 10 MW geothermal developments will be financially viable for either public or private sector developers because of the high equity requirements for the exploration phase with an unmitigated resource risk. The financial assessment confirms that geothermal development in Indonesia is likely to remain constrained without the proposed project.

35. Geothermal resource development is financed primarily by equity or against corporate balance sheets as commercial banks are reluctant to assume resource risks. Capital market financing is not available as market investors do not take resource risks. Currently, there is no financier or investor in Indonesia who provides risk money of the proposed scale for geothermal resource exploration other than GCF.

36. Geothermal power generation capacity needs to be expanded for Indonesia to realize its commitment to reduce GHG emissions by 29 per cent by increasing the share of renewable energy. Financial support designed and proposed by the project can be effective in promoting investments in geothermal resource exploration and subsequently geothermal power development. An alternative funding source to GCF is unlikely to exist in the current market. Accordingly, the **i**ndependent TAP considers that the needs of the recipient are "High".

1.5 Country ownership *Scale: High*

Existence of a national climate strategy and coherence with existing plans and policies

37. The GOI committed in its first NDC (2016) to a reduction in CO_2 emissions of 26 per cent and up to 41 per cent with international support against the business as usual scenario by 2020. The GOI subsequently promulgated the national action plan on GHG emission reduction and GHG inventory through presidential regulation.

38. The National Energy Policy of Indonesia targets an increase in renewable energy to 23 per cent in the energy mix by 2025, where renewable energy contributes 7 per cent to the national energy consumption. MEMR has issued several regulations to accelerate the development of the geothermal sector.

Capacity of accredited entities and executing entities to deliver

39. PT SMI is an accredited entity with GCF and will be the executing entity for the project. With 100 per cent ownership by the MOF, PT SMI is mandated to facilitate the implementation of the GOI infrastructure development agenda through partnerships with private and multilateral financial institutions. PT SMI is expected to transform into Indonesia's national development bank.

40. PT SMI is in partnership with international organizations on various development agendas. The partnerships include Agence Française de Développement (renewable energy), United Nations Development Programme (wind power), Asian Development Bank and Korea Development Bank (public-private partnerships transaction advisory), World Bank (regional infrastructure development fund and geothermal resource drilling), Asian Development Bank and Kreditanstalt für Wiederaufbau (municipal financing and development of environmental and social management system), and Gesellschaft für Internationale Zusammenarbeit (renewable energy, energy-efficient street lighting and sustainable urban transport/bus rapid transit).

41. PT SMI will manage the project pipeline, evaluate and select the developers participating in the proposed project and administer the loan portfolio. A project management unit established to manage the Geothermal Energy Upstream Development Project,[2] another project developed previously and currently ongoing, will be expanded to help PT SMI to manage the GREM daily operations and liaise with key stakeholders for successful implementation of the project and subsequently of geothermal power development in Indonesia. PT SMI will coordinate closely with a Joint Committee, which will constitute the key stakeholders in the geothermal sector, namely MOF and MEMR.

42. The AE will support PT SMI in the project implementation. This includes working with PT SMI in defining the key features of GREM and supervising compliance with AE requirements and standards, including safeguards standards, and stakeholder consultation and management, and providing technical support on reviewing drilling results and capacity-building for drilling management. The AE prepares periodical reports for GCF on the overall progress of GREM.

43. PT SMI has extensive experience in managing the safeguards policies of the AE and other donors and complying with relevant fiduciary procedures and standards under the Indonesia Investment Guarantee Fund, the Indonesia Infrastructure Facility Fund and the Regional Infrastructure Development Fund.

Engagement with national designated authorities, civil society organizations and other relevant stakeholders

44. The AE has prepared the project in close coordination with MOF (the NDA) and PT SMI as well as the broader stakeholders, including Small and Medium Enterprises, in the geothermal sector in Indonesia. MOF support for the project is demonstrated in its USD 150 million commitment of parallel financing to be provided through PT SMI/PISP.

45. The AE has also approached private developers to gauge their interest in participating in GREM if implemented.

[2] Available at <http://documents.worldbank.org/curated/en/762021486868465688/pdf/PAD-Indonesia-Geothermal-Project-P155047-01232017.pdf>.

46. At the subproject level, community consultations, including with local governments, will be a requirement as part of the implementation of the project's environmental and social management framework.

47. A no-objection letter is issued by the national designated authority and attached to the funding proposal.

48. The independent TAP concludes that the country ownership is "High". Geothermal resource development is in line with the GOI strategy to reduce GHG emissions as committed in its NDC. PT SMI, an executing entity, is a GCF AE and has a track record of partnership with international organizations and in supporting geothermal resource exploration with the AE in Indonesia.

1.6 Efficiency and effectiveness *Scale: Medium*

49. The total GCF funding contribution of USD 185 million is co-financed with a USD 325 million loan from the AE. GCF funding will achieve a leverage ratio of 1:1.75 with the AE financial assistance.

50. On top of the AE co-financing, a USD 150 million of parallel financing will be provided by the PT SMI/PISP. As per the requirement to inject equity of not less than 25 per cent of the subproject cost, USD 100 million can be mobilized from the private developers. If PT SMI/PISP loan and private sector equity contributions are included, the co-financing ratio increases to 1:3.1. The leverage ratio of the proposed project is moderate as co-financing and private sector investment in exploration drilling activities are limited.

51. The AE further projects that GREM would attract USD 3.34 billion of long-term private capital and financing to implement geothermal power generation plants downstream.

52. A financial model prepared by the AE projects a positive return for GCF funding under the base case scenario where 13 subprojects are supported at 75 per cent success rate with mixed realized potential. This is translated that GCF will recover the entire contribution of USD 150 million on the private sector window at year 10 and USD 25 million public sector window at year 20

53. An initial capital contribution of USD 500 million from GCF and the AE for resource risk mitigation under Component 1 is projected to enable development of at least 1,000–1,500 MW of geothermal generation capacity. The AE estimates the GREM contribution to annual GHG emission reductions of at least 6.2 $MtCO_2$ per annum. This translates into USD 21.4 per CO_2eq against the total investments including those in the future geothermal generation capacity, and USD 1 per tCO_2eq against the USD 185 million GCF funding contribution.

54. The cost of CO_2 emission reduction against the GCF funding contribution is low but dependent on successful implementation of geothermal power generation plants. The low cost of GHG emissions reductions is arguably not fully attributable to the proposed project.

55. The independent TAP views the project's effectiveness and efficiency as "Medium".

II. Overall remarks from the independent TAP

56. The independent TAP recommends that the Board consider the project as presented.

57. The project's impact potential in the long term can be notable. The AE estimates that 1,000–1,500 MW of additional geothermal resources can be realized in Indonesia, which will result in a reduction in GHG emissions of 6.2 MtCO2eq annually or 187 MtCO2eq for 30 years. The proposed risk mitigation model of GREM is innovative and has potential for replication. The GREM is expected to assist the GOI in developing and managing the nation's geothermal resource exploration programme holistically and as a package. The project's direct economic and social co-benefits are limited and short term. But they could be significant if subsequent geothermal power generation facilities are constructed and operated.

58. The project is in line with the GOI strategy to reduce GHG emissions and achieve a higher electrification rate. Private sector investments in geothermal resource exploration can be promoted if resource risk is mitigated by the financial assistance offered by GREM.

59. GCF participation in the project is considered to be critical. Both the AE and PT SMI possess experience and a track record, individually and in partnership, in geothermal energy development in Indonesia.

60. It should be noted, however, that the impacts that GREM is expected to deliver are dependent on the subsequent implementation of geothermal power generation capacity as a result of successful exploration drilling. Even with a successful drilling outcome, private investors' decisions to proceed to the implementation of geothermal power generation facilities will be subject to a power generation tariff to be negotiated and agreed with PT PLN.

61. Under the recent regulation, private developers can expect to have a power generation tariff agreed by PT PLN as long as it is lower than the costs PT PLN avoids in the local power system. The local power system is dominated by fossil-fuelled power generation; therefore, the avoided costs for PT PLN may be low compared with a tariff that private developers require to establish commercial viability and to attract commercial financiers and investors. In such a case, private developers are required to negotiate and agree a generation tariff with PT PLN. The past record shows that tariff negotiations have taken a long time even in successful cases.

62. The AE estimates impact potential of the first tranche to be approximately 60 per cent of that should two tranches be combined.

Independent Technical Advisory Panel's assessment of FP084

Proposal name:	Enhancing climate resilience of India's coastal communities
Proposal number:	United Nations Development Programme
Project/programme size:	Medium

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: High*

Adaptation impact

1. The proposal is divided into three main components.

2. Component 1 is based on ecosystem-based adaptation (EbA) and involves the conservation, restoration and management of coastal ecosystems in 24 target landscapes in 12 coastal districts. Restoration activities will cover a total of 15,000 hectares (ha) of coastal ecosystems, including mangroves, saltmarshes, seagrass beds, coral reefs and coastal watersheds.

3. Component 2 consists of supporting the establishment of climate-resilient livelihoods through the provision of technical assistance, training, necessary equipment and facilities, and the strengthening of value chains and market linkages.

4. Supported livelihoods include a System for Rice Intensification; crab fattening; mussel farming; oyster farming; a crab hatchery; ornamental fishery; integrated duck-fish farming; seaweed farming; honey production; mushroom cultivation; the cultivation of aromatic and medicinal plants; micro, small and medium-sized enterprises (MSMEs) for fish value-added products; fishmeal plants; fish smoking; handicrafts MSMEs; solid waste processing units; solar equipment repair; gas stove repair; scuba diving; and tourist guiding.[3]

5. To strengthen value chains and market linkages, activity 2.1. will facilitate backward linkages for supply input, and forward linkages for processing, packaging, storage, refrigeration, transport and market access.[4] For example, for beekeeping enterprises the project will provide jars for processed honey and will support households in establishing a storage facility. Participants will be provided with technical assistance and training on storing, processing, packaging, marketing and selling the produce. With the same objective, the list of supported livelihoods includes value addition activities (including fish value-added products MSMEs, fishmeal plants, fish smoking, handicrafts MSMEs) and crab hatcheries. In this matter, it can be said that there is a lack of livelihoods related to value addition of agriculture products.

6. The project specifically targets households experiencing climate change impacts, very poor households and those belonging to marginalized groups.

7. Livelihoods will be implemented through a range of organizations at the community level, including Gram Panchayats (local self-governance institutions), self-help groups, village organizations (federations of self-help groups), fishermen cooperative societies, farmer

[3] Feasibility study (annex II), page 175.
[4] Funding proposal, page 34, paragraph 106.

producer organizations, eco development committees, Van Samrakshan Samitis and joint forest management committees.

8. Component 3 is aimed at strengthening governance and the institutional framework. This will be achieved by establishing multi-stakeholder coordination structures and a pan-Indian Coastal Resilience Network of organizations, tertiary institutions, coordination platforms and coastal districts, and by supporting the integration of EbA approaches into relevant policy and legislation. It also includes provisions for knowledge management. [5]

9. The direct beneficiaries are calculated as the participants of climate-resilient livelihoods and their families. It is expected that approximately 350,000 households will be directly benefited by the livelihoods component. At 5 persons per household, it yields 1,750,000 beneficiaries. Indirect beneficiaries are estimated at 10 million, corresponding to the total population of the 24 targeted landscapes that will benefit from enhanced shoreline protection as a result of EbA activities and strengthened institutional capacity.[6]

10. The climate vulnerability assessment of the coastal districts, produced under activity 1.1, will form the basis for the creation of a decision-support tool for climate-responsive planning and development at the state and national level. The tool will provide national and state governments, non-governmental organizations (NGOs) and local communities with dynamic and regularly updated information, supporting them on the design and implementation of EbA measures. This will help to mainstream climate change adaptation into policies and plans.

11. Activities under output 3, related to the creation of institutional coordination platforms, the support to the integration of climate change and EbA approaches to policies and legislation, and to knowledge management, will help to strengthen the institutional and regulatory frameworks for climate-responsive planning and development.

12. The conservation and restoration of coastal ecosystems together with the state-wide awareness campaigns will certainly reduce the exposure of the population to risks arising from climate change, such as storm surges and sea level rise.

1.2 Paradigm shift potential *Scale: High*

Innovation

13. Although EbA is already being implemented on a smaller scale in the region,[7] it can still be considered innovative as opposed to the traditional interventions for shoreline protection through hard infrastructure. The project presents an integrated approach that involves the conservation, restoration and management of ecosystems which will serve to protect coastal communities from the effects of storm surges and sea level rise, and bring support to the establishment of climate-resilient livelihoods that will, at the same time, use the goods and services supplied by the ecological infrastructure. For example, crab farming and honey production will benefit from restored mangroves and tourism activities will benefit from restored coral reefs.

Potential for knowledge and learning, scaling up and replication

14. Several knowledge products will be developed by project activities, such as: (a) a decision-support tool for decision makers combined with a dynamic and interactive online platform to facilitate access to information related to ecological and socioeconomic

[5] Funding proposal, page 29.
[6] Funding proposal, pages 52 and 53.
[7] Funding proposal, pages 24 and 25.

vulnerability to climate change; (b) a video in each of the three target states on the restoration and conservation activities; (c) site restoration protocols to define community roles in co-management and arrangements for sustainable harvesting; (d) target landscape integrated management plans; and (e) a coastal calculator tool for the design of shoreline protection and other climate-resilient infrastructure measures.

15. Moreover, activity 3.3 is completely focused on the generation and dissemination of lessons learned and best practices between target landscapes, coastal states and coastal countries in the South Asian subregion to facilitate scale-up and replication. Specific activities under this component include: (a) supporting the National Coastal Mission to establish a system for collecting data and information on global best practices, lessons learned, evidence from the field and scientific knowledge on EbA; (b) organizing annual workshops hosted by the pan-Indian Coastal Resilience Network to share research findings related to coastal EbA, involving tertiary institutions, research organizations and relevant NGOs; (c) developing a training course on EbA to deliver at the national and state level; (d) developing knowledge products translated into local languages for use in community-level training courses; (e) promoting exchange visits for national-, state- and district-level government officials and community leaders; and (f) creating a knowledge exchange platform involving South Asia's five coastal countries.

16. All these knowledge generation and dissemination activities, plus the institutional capacity-building activities, give to the project very significant potential for scaling up and replication in other Indian states and other countries of the region.

Contribution to the creation of an enabling environment

17. Detailed site-specific operations and maintenance (O&M) manuals will be developed for the EbA and livelihoods interventions. The manuals will consider the biophysical factors associated with EbA and the equipment and facilities associated with livelihoods.

18. To promote sustainability the project will create co-management structures for the 24 landscapes that will support community ownership and responsibility for restored areas. Community-based monitoring and maintenance programmes will be implemented through these structures.

19. The O&M costs for the infrastructure associated with livelihoods will be covered by beneficiaries from the revenues obtained with the activities.

20. Part of the co-financing from the three participating states will be allocated to cover the maintenance of ecosystems for six years during project implementation. For the first three years of operation (years 3 to 5 of the project) the funds will come from the GCF grant and afterwards it will be covered with government funds.[8]

21. If the implemented livelihoods are demonstrated to be successful during the project lifespan, it could be expected that the beneficiaries managing the activities will be able to cover the O&M costs beyond project completion. However, the sensitivity analysis shows that in a scenario with a 10 per cent increase in costs and a 10 per cent decrease in revenues, the livelihoods of the State of Andhra Pradesh give a total net present value (NPV) of minus USD 10 million and an internal rate of return of 8.6 per cent. Therefore, the financial sustainability will be compromised if a cost overrun or a decrease in revenues within a probable range of occurrence (+/- 10 per cent, respectively) materializes.

22. On the other hand, sustainability of the restored ecosystems is completely dependent on the availability of government funds to cover management and maintenance costs, since

[8] Operation and Maintenance Plan (annex XIII b), page 3.

the management of the ecosystems will not return direct profits. The annual O&M costs for restored ecosystems are estimated at USD 3 million.[9]

23. The establishment of value addition enterprises can be expected to support the sustainability of aquaculture-related livelihoods by providing local buyers for their products.

24. The provision of technical assistance to develop bankable business plans to access loan finance for expansion will also support sustainability beyond project lifespan.

Contribution to the regulatory framework and policies

25. Under component 3, the following activities will support mainstreaming of climate change adaptation considerations into public and private sector policies and planning at the local and national level: (a) supporting the new National Coastal Mission to integrate climate risk management and EbA principles into national policies and schemes, including the Compensatory Afforestation Fund Management and Planning Authority initiative and the Smart Cities Mission; (b) facilitating biennial intersectoral dialogues under the National Coastal Mission; (c) equipping the interdepartmental coastal zone management platforms in 13 coastal states to use EbA in scenario planning; (d) developing EbA plans for four coastal 'Smart Cities' (Kalyan in Maharashtra; Kakinada and Visakhapatnam in Andhra Pradesh; and Bhubaneswar in Odisha); (e) working through interdepartmental platforms to provide coastal town planners and engineers with training on the use of the United Nations Development Programme (UNDP) Coastal Calculator Tool to design shoreline protection measures based on EbA. However, these activities are not described in detail in the funding proposal.[10]

1.3 Sustainable development potential *Scale: Medium*

Environmental co-benefits

26. The restoration and conservation of coastal ecosystems will contribute to the protection of biodiversity, including important wildlife species such as turtles, saltwater crocodiles, marine fish, marine mammals and migratory birds.

27. In response to the concerns expressed by the independent Technical Advisory Panel (TAP) during the previous submission of the present proposal (for the nineteenth meeting of the Board (B.19)) about the risk of negatively impacting wild populations through the unwanted encouragement to harvest wild seedlings for aquaculture activities, the proponent carried out an independent assessment on the sustainability of the proposed aquaculture activities. For the proposed mussel and oyster farming activities, the seeds are obtained through the placement of appropriate collector structures on natural breeding areas, and the larvae naturally attach to it. Given that the quantity of larvae is immeasurable in relation to the fraction that can find a place to settle and grow, the collection of mussel and oyster seedlings would not impact wild populations. However, in order to have a secure and stable source of seeds and to allow bivalve farming in areas where there is no natural breeding stock, a bivalve hatchery is already under development in the State of Maharashtra.[11] Ornamental fish culture would not involve harvesting of wild seeds, since almost all of these small-scale activities are backed up by a breeding unit. In addition, there is a clown fish hatchery under development in New Bombay. The project is expected to implement approximately 20 per cent of the total planned crab farms (4,333) in its first two years, during

[9] Annex III g, sheet "Assumptions".
[10] Funding proposal, page 35.
[11] Annex XIII (o) "Technical study: assessment of the sustainability of the fisheries based livelihoods component", pages 11 and 15.

which time seedlings would be provided by the Rajiv Ghandi Centre for Aquaculture, which indicated that it has sufficient capacity to supply this quantity. After the first two years, the crab hatcheries included under the project should be able to provide the rest.

28. The proposed approach for mussel and oyster farming (off-bottom culture using the rack and ren method) is considered a low-impact sustainable coastal aquaculture activity. It does not need feed input because it grows on natural planktonic organisms and suspended particulate matter. The waste generated out of the system is in the form of pseudofaeces and faeces, which are low in nutrient emissions.

29. Unmanaged waste disposal in crab farming can result in ecosystem degradation, so these activities should be effectively overseen. In this regard, the State of Maharashtra has already developed a guideline for the carrying capacity assessment of sustainable, small-scale aquaculture activities, to be used by the Mangrove Foundation in coastal Maharashtra. Similar guidelines are expected to be developed for the other states. A preliminary study by the Mangrove Foundation suggests that the water bodies in the State of Maharashtra have sufficient unutilized carrying capacity to support the aquaculture activities proposed by the project. More detailed carrying capacity assessments will be developed for the receiving water bodies once the first aquaculture units are being developed. This study will involve measuring the nutrient profile of the water bodies before, during and after the activities are functional.[12]

30. Regulations for coastal aquaculture in India are being updated to include small-scale coastal aquaculture in intertidal marine areas.[13] These regulations will apply to waste management of the proposed aquaculture activities.

31. The project also includes a mitigation component, since the restoration of ecosystems will promote carbon storage and sequestration. The annual carbon storage and sequestration potential was estimated at 3.7 million tonnes of carbon dioxide equivalent (t CO_2 eq) over a 30-year period. However, calculations made to estimate this value were not found in the proposal. The newly submitted technical study on sustainability of aquaculture activities suggests that the 85 ha of restored seagrass ecosystems could store over 40,000 t CO_2 eq during the 10-year period that it takes for the ecosystem to reach a mature state. Taking into account that the project also intends to restore over 10,000 ha of mangroves, it is presumable that the total carbon sequestration potential of the project activities could reach the estimated 3.7 million t CO_2 eq.

32. The project expects to establish 145 solid waste processing units to recycle plastic, Tetrapack and biodegradable waste. This will have a significantly positive environmental impact regarding solid waste contamination.

33. Although the implementation and operation of some livelihoods can have some relatively minor negative environmental impacts, these can be mitigated by following the due diligence and mitigation approaches presented in the Environmental and Social Management Framework.[14]

Social co-benefits

34. The established livelihoods will provide the beneficiaries with more sustainable and adaptive income sources, which will support a better quality of life in general.

[12] Annex XIII (o) "Technical study: assessment of the sustainability of the fisheries based livelihoods component", page 9.
[13] Annex XIII (o) "Technical study: assessment of the sustainability of the fisheries based livelihoods component", page 7.
[14] Annex VI b, page 19.

35. Homestead gardening will improve food security, and restored coastal ecosystems will provide physical protection to people and public infrastructure against storm surges.

Economic co-benefits

36. The increased income of livelihoods beneficiaries can have a positive effect on the local economies.

37. While project activities do not describe specific actions towards strengthening value chains (apart from including value addition enterprises in the list of livelihoods), it is expected that if the new livelihoods demonstrate success during the first years, other value chain actors will enter the market following the increased supply of products.

38. The enhanced shoreline protection achieved by the restored ecosystems will help to reduce damage to infrastructure caused by storm surges, reducing losses due to extreme climate events, which are expected to increase as a result of climate change. The potential to reduce economic losses is estimated in the funding proposal as a reduction in deaths and damage to infrastructure, evaluating scenarios with reductions of 10, 20, and 30 per cent, which seems rather arbitrary because there is no hard evidence to demonstrate that project activities could achieve those reductions.[15]

39. Ecosystem restoration activities will provide short-term work opportunities, and maintenance of ecological infrastructure will provide long-term job opportunities.

Gender-sensitive development impact

40. The selection criteria for the climate-resilient livelihoods took into account the potential to selectively benefit women, resulting in the selection of livelihoods such as mussel and oyster aquaculture, mangrove crab farming, cultivation of mushrooms and medicinal plants, and fish value-addition activities, all of which are culturally acceptable for women to participate in.[16]

1.4 Needs of the recipient *Scale: High*

Vulnerability of the country

41. The expected impacts of climate change on the coastal zone of India include higher temperatures, changes in precipitation patterns, increased incidence of extreme weather events and sea level rise. The population living in the coastal zone is vulnerable to flooding, saline intrusion and declining fish stocks, which will be exacerbated by climate change.[17]

Economic and social development level

42. India is a lower middle-income country, with great income inequality. Approximately 21 per cent of Indians live below the international poverty line of USD 1.90 per person per day.

43. Because of its limited financial capacity, the majority of India's investments are directed to the construction of ports, roads, railways and associated economic infrastructure, rather than on building the climate resilience of the vulnerable population.

[15] Annex XII b.
[16] Funding proposal, page 62, paragraph 210.
[17] Funding proposal, page 63.

44. The project intervention area contains significant numbers of members of scheduled castes and tribes who suffer disproportionately from poverty because of social discrimination, landlessness and limited access to resources and economic assets.[18]

Absence of alternative source of financing

45. Given the economic development of the targeted communities, it is clear that they lack the financial resources and technical capacity to implement restoration activities and alternative livelihoods.

46. Restoration and conservation of coastal ecosystems are of a public goods nature and cannot be considered as economic activities since they will not return direct profits, so EbA activities are not likely to crowd out private investment.

47. Livelihoods will be implemented in small-scale enterprises comprised of poor people who lack financial capacity.

The need for strengthening institutions and implementation capacity

48. The limited institutional capacity and cross-sectoral coordination for integrating climate change adaptation measures into coastal zone planning, governance and finance is identified as a barrier in the funding proposal[19] and is addressed through activities under component 3.

1.5 Country ownership *Scale: High*

Alignment with priorities in the country's national climate strategy

49. Project activities contribute to India's nationally determined contributions and are aligned with the National Action Plan on Climate Change (NAPCC) and the target states' State Action Plans on Climate Change.

50. The proposed project is aligned with the following NAPCC missions: (a) Green India Mission: restoration/reforestation of 6 million ha of degraded forest lands to expand India's forest cover from 23 to 33 per cent; (b) National Mission for Sustainable Agriculture: development of climate-resilient crops, expansion of weather insurance mechanisms and improved agricultural practices; and (c) National Mission on Strategic Knowledge for Climate Change: assessment and evaluation of the impacts, effects and challenges of climate change and promotion of private sector initiatives to develop adaptation and mitigation technologies through venture capital funds.[20]

Capacity of accredited or executing entities to deliver

51. UNDP has experience in working with the Government of India and managing a large portfolio of environmental projects, including giving support to the Ministry of Environment, Forest and Climate Change (MoEFCC) on the preparation of the State Action Plans on Climate Change. UNDP's experience includes 56 EbA projects globally, focused on protecting, restoring and managing natural ecosystems to help vulnerable communities to adapt to climate change.

52. The executing entity is MoEFCC. At the state level, MoEFCC will implement project activities through the forest departments of each state: the Environment, Forests, Science and Technology Department in the State of Andhra Pradesh, the Revenue and Forest Department

[18] Funding proposal, page 64.
[19] Funding proposal, page 23, paragraph 65.
[20] Funding proposal, page 65, paragraph 220.

in the State of Maharashtra and the Forest and Environment Department in the State of Odisha.

53. At the national level, MoEFCC is responsible for planning, promotion, co-ordination and overseeing the implementation of environmental and forestry policies and programmes, including all matters related to climate change, and coordinates the implementation of the National Action Plan on Climate Change.

54. MoEFCC's experience include executing donor-funded projects, such as the Global Environment Facility (GEF)-funded projects "Conservation of Coastal and Marine Biodiversity in East Godavari River Estuarine Ecosystem" and "Mainstreaming Coastal and Marine Biodiversity Conservation into Production Sectors in Sindhudurg Coast in Maharashtra", managing the Compensatory Afforestation Fund Management and Planning Authority initiative to promote conservation and restoration of forests, infrastructure development, wildlife conservation, and training of forest departments. Other initiatives managed by MoEFCC include investments in pollution abatement and watershed management through the National River Conservation Directorate.

55. Activities under component 3 will help to improve the coordination and knowledge management capacity of the involved institutions at the state and local level through the creation of multi-stakeholder coordination platforms and the pan-Indian Coastal Resilience Network, and training activities. Activities under component 3 are not described in detail in the funding proposal, making it difficult to assess their efficiency.

Engagement with civil society organizations and other relevant stakeholders

56. In 2016, MoEFCC led the process of consultations with key government stakeholders at the national level through the forest department of each targeted state.

57. As described in the stakeholder consultations report, the design phase included consultations with communities, community-based organizations (CBOs), NGOs, research institutions, private sector and role-players from various spheres of government. In general, the stakeholder consultations report shows a high level of participation of representatives of governmental institutions, NGOs, research institutes and the private sector. However, consultations with community representatives seem to be limited to seven meetings, with a low attendance, varying from one to seven persons.[21] In these meetings there is a very small share of farmers and representatives of CBOs: only two farmers and two representatives of self-help groups in total in all seven meetings. This fact raises concerns regarding the acceptability of the project and the willingness of the direct beneficiaries to participate in it, which play a key role in the success and sustainability of project activities.

58. On the other hand, the implementation phase is designed to have strong community participation. Community organizations and eco development committees will engage in project implementation through the establishment of co-management structures involving government and CBOs/NGOs. Restoration works will be undertaken by eco development committees within protected areas, and Van Samrakshan Samitis outside protected areas, and will pay community participants for the work.[22]

1.6 Efficiency and effectiveness *Scale: Medium*

[21] Feasibility study (annex II), page 261.
[22] Funding proposal, page 33, paragraph 105.

Cost-effectiveness and efficiency

59. The cost of the livelihoods component is of approximately USD 30 per beneficiary,[23] accounting for entire households even though only one person per household will participate in the implementation of the new livelihood. As it is, the unit cost seems to be very low in comparison with other projects, but it must be taken into account that of the 350,000 benefited households, roughly 290,000 are included under the Systems of Rice Intensification, where the project will invest in weeding tools and technical support with a total cost of USD 15 per beneficiary. If the Systems of Rice Intensification were taken out of the proposal, the cost of livelihoods would rise to USD 160 per beneficiary.

60. The cost-effectiveness of the proposed EbA solutions has already been tested in other past and ongoing projects in the region, including three UNDP-managed GEF-financed projects (Sindhudurg, EGREE, Gulf of Mannar) involving the restoration of coastal ecosystems and generation of ecosystem-based livelihoods, the Asian Development Bank-managed Special Climate Change Fund project, "India: Climate Resilient Coastal Protection and Management", working in Karnataka and Maharashtra, and the Deutsche Gesellschaft für Internationale Zusammenarbeit funded AdaptCap Project in coastal Tamil Nadu and Andhra Pradesh.[24]

61. Worldwide evidence demonstrates that EbA approaches can be cost-effective in the objective of enhancing adaptation to climate change impacts, while simultaneously delivering multiple social, economic and environmental benefits.[25]

Financial viability

62. A financial analysis was carried out for each of the proposed livelihoods.

63. Restoration and conservation of coastal ecosystems are of a public goods nature and cannot be considered as economic activities since they will not return direct profits. Benefits are quantified as reduced economic losses, considered as a reduction in deaths and damage to infrastructure, evaluating scenarios with reductions of 10, 20 and 30 per cent, which seems rather arbitrary because there is no hard evidence to demonstrate that project activities could achieve those reductions.

64. The financial analysis demonstrates a high degree of economic efficiency, with an average economic rate of return of 16 per cent for livelihood activities (approximately 26 per cent for paddy rice activities), and well above 25 per cent in most coastal protection activities.[26]

65. It should be noted that in the sensitivity analysis, considering a 10 per cent increase in costs and 10 per cent decrease in revenues at the same time, the NPV of livelihoods investments in the State of Andhra Pradesh is of minus USD 10 million (negative) and an internal rate of return of 8.6 per cent.[27] This shows that the financial sustainability of the new livelihoods is relatively fragile.

66. In response to the concerns raised by TAP during the B.19 revision about the implementation and maintenance costs of some of the ecosystem restoration activities, the proponent submitted a cost–benefit analysis for the activities associated with the restoration of 85 ha of seagrass in Chilika and 35 ha of coral reef in Sindhudurg. The study presents an assessment on the cost, benefits and rate of return of the proposed activities against

[23] Considering 1,750,000 beneficiaries of the livelihoods component and costs of output 2 only.
[24] Funding proposal, page 70, paragraph 242.
[25] UNDP. 2015. *Making the Case for Ecosystem-based Adaptation: The Global Mountain EbA Programme in Nepal, Peru and Uganda*. New York: UNDP.
[26] Funding proposal, page 69, paragraph 238.
[27] Annex XII b, sheet "Output 2 – livelihoods".

alternative approaches. The quantified benefits include tourism, coastal protection, fisheries, biodiversity and carbon sequestration (only for seagrass). For coral reefs, the economic internal rate of return (EIRR) for the proposed approach would be 25 per cent, while that of the alternative approach would be 7 per cent. The economic net present value (ENPV) of the proposed approach would be USD 6.7 million, while the ENPV of the alternative approach would be USD 4.7 million. This shows the proposed approach is more cost-effective.

67. The cost–benefit analysis for seagrass would have more modest economic benefits. A discount rate of 6 per cent gives an ENPV of minus USD 1.8 million and an EIRR of 3.1 per cent. However, as explained by the proponent,[28] it should be noted that seagrass restoration is part of a comprehensive EbA approach, which, as a whole, presents a positive economic outcome. Also, given the current plans of the Odisha Forest Department on seagrass restoration, this activity in particular could have a high upscaling potential. The results of the restoration activities on the proposed 85 ha would serve as a learning experience to be scaled up to 18,000 ha of degraded seagrass meadows in the Chilika Lake, in addition to the described upscaling and replication methods for the project.

Amount of co-financing

68. For a total project cost of USD 130.3 million, the GCF grant for USD 43.4 million will leverage co-financing from the Government of India for USD 86.9 million, representing a co-financing rate Government of India /GCF of 2. The Government of India will be funding 67 per cent of total project costs. Co-financing will come from the three participating states and from MoEFCC at the national level.

Application of best practices

69. The design of the proposed project incorporates best practices from international literature on EbA and lessons learned on past and ongoing projects in the region.[29]

70. Local knowledge and expertise will be incorporated to restoration and conservation activities with community participation through paid labour. Communities will receive training to participate in the monitoring of coastal ecology and ecosystem health, and in undertaking carbon assessments and measuring carbon sequestration.[30]

71. Aquaculture projects will use an integrated aquaculture system approach, which can help to prevent damage to surrounding ecosystems. Improved waste management techniques will be used to mitigate the negative effects of waste disposal, and where appropriate, integrated duck and fish farms, and multi-trophic ponds will be established.[31]

72. Other best practices include the provision of technical assistance to community groups in the target landscapes to set up certification schemes for ‘eco’ products, and to develop bankable business plans to access loan finance for expansion, during or post-project, as well as insurance on assets.

[28] “India 5991 Responses to iTAP Comments of 30 April - 11 May.docx”, comment 2.
[29] Funding proposal, page 71, paragraph 250.
[30] Funding proposal, page 72, paragraph 253.
[31] Funding proposal, page 74, paragraph 257.

II. Overall remarks from the independent TAP

73. This project has high impact, paradigm shift potential, country ownership and need of the recipients.

74. In the B.19 review of this project, TAP requested additional information on the seagrass intervention. In this submittal, the accredited entity supported the maintenance cost of seagrass with evidence. International experience reports economic benefits of seagrass on coastal ecosystems. The economic benefit of these interventions, analysed at a 3 per cent discount rate, results in a low positive NPV. Since seagrass intervention is a relatively small component of the overall project, a low NPV is acceptable.

75. The rest of the interventions were assessed by TAP and found to be adequate for the objectives of this funding proposal.

76. Based on the above, TAP recommends approving this project.

77. TAP recommends that the accredited entity implements a system to charge a fee to tourists attracted to this coastal area as a payment for ecosystem services to be used to support this project and its potential expansion/scalability.

Independent Technical Advisory Panel's assessment of FP085

Proposal name:	Green BRT Karachi
Accredited entity:	Asian Development Bank
Project/programme size:	Large (> 250) in USD million

I. Assessment of the independent Technical Advisory Panel

1.1 Introduction

1. The project is a 30 km fully segregated bus rapid transit (BRT) system, including cycle lanes, a bicycle-sharing system, last-mile connectivity with e-pedicabs and improved pedestrian facilities. A key characteristic of this BRT project that sets it apart from other such systems previously implemented in other countries in the recent past is that the BRT buses will be fuelled by biogas. The biogas will be produced from the digestion of cattle waste with the biogas used in biomethane hybrid buses that will run on the BRT route. The project will also cover the restructuring of the public transport network and a fleet-scrapping programme and compensation mechanism. The project will be located in the city of Karachi, the largest city in Pakistan, which according to the 2017 census has a population of about 14.9 million and is currently noted to have very acute traffic congestion on many of its inner city transportation routes. Karachi does not have a public transportation system, rather its transport system is made up mostly of informal paratransit vehicles and approximately 4,000 privately owned buses. These are weakly regulated, poorly organized with irregular frequencies and lack designated schedules, stops and customer standards. The result is a chaotic system characterized by long commuter journey times, the rise of private and paratransit modes and the decline of public transport.

2. The weakness of the existing city transport system is recognized, and it has started to receive local and international interventions. For example, the Government of the Democratic Republic of the Congo for decades and until recently, made large investments in various flyovers within Karachi which reflected the prioritization of private road transport over public transport. These interventions have not changed the structure of the city transportation system, which continues to be crowded and unorganized with traffic congestion and traffic-induced air and noise pollution. This is part of the attributes that contributed to Karachi being classified as one of the world's most unlivable cities. The Japanese International Cooperation Agency (JICA), in 2008–2012, developed the Karachi Transportation Improvement Project, comprising a Transport Master Plan for Karachi, which proposes a mass transit network composed of two metro-rail lines, the revival of the Karachi Circular Railway and six BRT lines, of which the Red, Green and Yellow lines were prioritized for immediate implementation. The Asian Development Bank (ADB) built on this initiative by providing the necessary technical assistance for the preparation/design of the Karachi BRT, which has now culminated in this Green BRT Karachi project. This is one of the bases of the financial proposal that has been submitted for funding consideration to GCF by ADB.

3. This project is made up of the following components:

(a) **Component 1: Infrastructure.** USD 297 million has been earmarked for this component, which will finance the BRT core infrastructure, including the road infrastructure and its drainage system, landscaping, depot, terminals, stations, intersections, corridor traffic management systems, pedestrian crosswalks, sidewalks and cycle lanes along the corridor. The 28 km main corridor (red corridor) will be restructured over its entire width ("facade-to-facade") and will include:

(i) The BRT infrastructure comprising 25 stations and dedicated lanes built at-grade in the median;

(ii) The mixed-traffic roadway comprising up to six lanes in each direction in wider sections;

(iii) The non-motorized transport (NMT) infrastructure comprising cycle lanes and improved sidewalks along the corridor;

(iv) On-street parking and green areas added in various locations;

(v) A 2-km section of the common corridor, including three stations, will also be restructured to create a mall for pedestrians and BRT only, with a façade uplift of historical buildings; and

(vi) The BRT infrastructure will be completed with two depots, one underground staging facility and off-corridor bus stops;

(b) **Component 2: Equipment including buses, bicycle-sharing, e-pedicabs and a biogas plant.** USD 93 million has been earmarked for this component. This fund will be utilized to acquire the following equipment for the project:

(i) Buses: procurement of modern low-emission BRT fleet (mixture of 9 m, 12 m and 18 m in length);

(ii) Bicycle-sharing and e-pedicabs for last-mile connectivity;

(iii) Other equipment including an intelligent transportation system, fare collection and station management; and

(iv) Biogas plant: will be implemented as part of the project to produce natural gas grade biogas, which will use as feedstock dung from the 400,000 animals in Behn's cattle colony that produce milk for local consumption. In the absence of this intervention, some of the cow dung is sold as fertilizer while the balance is allowed to flow to the sea, where the fate is mostly aerobic digestion, yielding mostly carbon dioxide (CO2) into the atmosphere. It has been estimated that around 15 per cent of the animals in the colony is sufficient to fuel the BRT Red Line bus fleet on an ongoing basis;

(c) **Component 3: Environmental and social mitigation.** USD 22 million has been earmarked for the activities of this component, which is expected to cover:

(i) Setting up and implementation of the environmental management plan;

(ii) Setting up and implementation of the resettlement plan; and

(iii) Setting up of a bus industry restructuring programme including a compensation mechanism and a fleet-scrapping programme for excluded operators; and

(d) **Component 4: Project management and capacity-building, including outreach.** USD 59 million has been earmarked for the activities of this component, which will include:

(i) Construction supervision;

(ii) Capacity-building;

(iii) Conceptual design of Blue and Yellow BRT lines;

(iv) TransKarachi operating costs for three years; and

(v) Greenhouse gas (GHG) monitoring and reporting as well as documentation of core project aspects.

4. The total funding for the project will be provided according to the following sources:

(a) GCF senior loan with a tenor of 20 years and a concessional interest rate of 0.75 per cent per annum = USD 37.2 million;

(b) GCF grant = USD 11.8 million;

(c) ADB senior loan with a tenor of 25 years and an indicative interest rate of about 3.89 per cent per annum = USD 442.0 million

(d) Grant from the Government of Pakistan = USD 92.5 million

1.2 Impact potential *Scale: High*

The expected impacts

5. The project will have a direct reduction in GHG emissions from:

(a) The establishment of the BRT system with high-efficiency buses resulting in mode shift and improved efficiency of public transport compared to the status quo ante. Biomethane, hybrid buses will be the equipment that will be operating on the BRT lanes;

(b) The production of biomethane for BRT buses transport usage. In addition to biomethane being a green fuel, it will also displace the use of carbon-based fuel, thus delivering a reduction in GHG emissions. In the absence of the project, most cow dung, which is the feedstock for the biomethane system, is allowed to flow into nearby water bodies while a small percentage is sold as fertilizer. With the project, methane (CH4) produced by anaerobic digestion of the dung will be captured, cleaned and processed to high-concentration CH4. Thus, there will be a net reduction in GHG emissions. For such systems, the level of emission reduction will depend on the fate of the sludge produced in the cow dung digestion process. According to the project proponent, the sludge will be supplied to farms as fertilizers. The fate of the sludge is therefore an important monitoring parameter to ensure that the estimated GHG emission reduction is real and measurable; and

(c) The establishment of NMT facilities, including cycle lanes, bicycle-sharing and last-mile connectivity e-pedicabs, will also yield a reduction in GHG emissions as in the absence of the project, the majority of such journeys would have occurred using motorized, high carbon fuelled facilities.

6. From project calculations, about 75 per cent of the GHG emission reduction achieved by the project will come from the BRT system directly and 25 per cent due to usage of biomethane hybrid buses. GHG emission reduction delivered by the BRT system will include:

(a) 95 per cent of emission reductions due to use of more efficient buses (larger units, improved average load factor, lower fuel consumption);

(b) 3 per cent due to mode shift from passenger cars; and

(c) 1 per cent each due to mode shift from motorcycles and motorized rickshaws.

7. In addition, the project will provide strengthened adaptive capacity through the improved climate resilience of the BRT infrastructure, primarily through: an increased water retention capacity and slow infiltration; the utilization of lane strips with a median filtration system; the utilization of bioswales along corridors; the adding of drainage capacity; vegetation planted in station verges, with a bioswale strip as delineator path; and permeable pavements for pedestrian paths and cycle ways. A key issue with this adaptive capacity-building is that for the intervention to deliver the expected results, it must be properly engineered and constructed by experienced engineering firms. This is recognized by the project proponent, who has contracted the engineering and construction of these adaptive capacity-building elements to an experienced international engineering firm.

8. Key impact potential indicators of the proposed Green BRT Karachi project can be summarized as follows:

(a) It has been estimated that the project will result in an estimated annual GHG emission reduction of about 87,000 tonnes of carbon dioxide equivalent (tCO2eq) (average). For the 30-year lifetime of the system, this will amount to about 2,610,000 tCO2eq;

(b) It is also estimated that about 1.5 million people living within 1 km of a BRT station will directly benefit from the availability of more reliable and more efficient energy-fuelled public transportation, which will enhance their quality of life through better access to a modern and clean transportation system. This impacted population is 7 per cent of the population of Karachi; and

(c) Other relevant indicators of impacts that will be generated by the Green BRT Karachi project can be summarized as follows:

(i) Improved air quality in Karachi through an annual reduction of 723 tonnes of nitrogen oxides (NOX), 5.5 tonnes of fine particulate matter (PM2.5) and 9.5 tonnes of sulfur dioxide (SO2), improving the health of Karachi's citizens;

(ii) Improved city liveability through pedestrianization, safe cycling and less noise;

(iii) Major time savings for residents of Karachi estimated at USD 59 million per annum;

(iv) Reduced fatalities and injuries from accidents due to safer bus access, cycle lanes, mode switch towards public transport and a better regulated bus sector stopping at designated stations;

(v) Increased access of female passengers to public transport, increasing the share of female passengers from currently less than 10 to 20 per cent. The project will establish universal access and safety features for women, children and the disabled in all 28 BRT stations; and

(vi) A modern BRT system operating at a maximum six-minute headway over a network of 125 km in length with a daily ridership of 320,000 passengers.

Detailed methodology used for calculating the impact indicators

9. Different GHG accounting methodologies were used and the results are described below.

GHG accounting methodology for the BRT system

10. The methodological base for calculating the reduction in GHG emissions for the BRT system, based on the United Nations Framework Convention on Climate Change (UNFCCC) approach for mode shift towards mass transit systems which is based on the approved clean

development mechanism (CDM) baseline and monitoring methodology ACM0016 has been applied. The major elements used in the calculation are summarized as follows:

(a) Number of expected passengers for the BRT system;

(b) Expected share of passengers in the BRT system from baseline modes of transport and their average trip distance per baseline mode. The projected modal share is based on a transport model and the trip distances are based on surveys;

(c) Emission factors per passenger-km for different modes of transport based on: specific fuel consumption per mode; the net calorific value; the CO2 emission factor per fuel type; CH4 slip with the global warming potential of CH4 for compressed natural gas (CNG) vehicles; and average occupation rates per mode. A tank to wheels and a well to wheels approach is used. Direct emissions stated in the document for GCF include only tank to wheels emissions. Optimum scenario data from a carefully implemented demand survey were used to calculate baseline and project emissions in line with the approved UNFCCC baseline and monitoring methodologies; and

(d) Emission reductions are calculated based on the differential emissions per passenger using baseline modes of transit and the project emission factor per passenger multiplied with the activity level (number of passengers).

GHG accounting methodology for the biogas system

11. In the baseline situation, that is, without the biogas facility, cow dung from the animals at the dairy farm where the digester will be sited will be disposed of as follows: the manure rots partially on site while the larger amount is discharged into the adjacent bay. In this baseline situation, the fate of the cow dung is aerobic digestion, with the production of CO_2, which is emitted to the atmosphere. In the project situation, cow dung is digested in a facility where it undergoes anaerobic digestion to produce gaseous methane (~60 per cent CH_4 concentration) and sludge. The biogas produced undergoes a "gas sweeting" process, which upgrades it to 90 per cent CH_4 content. The biomethane is therefore upgraded and "cleaned" to achieve CNG quality prior to injection into the gas pipeline, with 1 m^3 of biomethane being equivalent in energy content to 1 m^3 of CNG. The sludge is usually piled up at the site of the digester and depending on the height of the accumulation CO_2 and CH_4 can be emitted from the sludge. CO_2 is produced in the outer layer of the sludge via aerobic digestion, while within the core of the sludge, anaerobic digestion can produce CH_4. Thus project emissions from the implementation of the project biomethane production facilities will include: CO_2 from aerobic digestion of surface sludge in the pile; CH_4 from the anaerobic digestion of the inner core of the sludge; and fugitive emissions from the pipeline system carrying biomethane to the natural gas pipeline. Since the GHG baseline conditions, including chemical oxygen demand and temperature of the lagoon, have not been monitored, the project does not claim any additional avoided CH_4 emissions from the manure;

12. However, it was stated in the funding proposal that a certain amount of funding has been earmarked in the budget of component 4 for the assessment of the lagoon baseline conditions and estimates of avoided GHG emissions from the biogas plant will be made using the UNFCCC CDM methodology AMS-III.H.[32] The monitoring reports will also be based on this methodology, including the CDM methodological tool 04 "Emissions from solid waste disposal sites" for potential leakage from sludge and the methodological tool "project emissions from flaring" to determine potential flaring emissions. The project does **not** currently claim any GHG reductions from avoided CH_4 emissions from the baseline manure and effluents. Thus monitoring efforts are planned, when the project is operational, to quantify additional GHG

[32] AMS-III.D for animal manure management systems states clearly that AMS-III.H shall be used if the manure is discharged into natural water resources.

reductions not claimed currently due to lack of baseline data measurements. However, getting additional GHG emission reduction from the biomethane system, which is currently not claimed in the emission reduction calculation, will depend very strongly on the fate of the sludge (how it is handled at the digester site and its eventual disposal fate); and

13. The monitoring protocol that will be implemented when the project is operational must comprehensively cover sludge monitoring (quantity produced, mode of storage at the site, disposal options for the sludge, etc.). This is the only way that the additional GHG emission reduction from the biogas plant can be transparently determined.

14. The result of the GHG emission reduction calculations showed that the project will generate an average of about 87,000 tCO_2eq/year and a total of 2,175,000 tCO_2eq over 25 years.

15. The Green BRT Karachi project will reduce global emissions by an estimated 2,175,000 tCO_2eq for a total GCF investment of USD 49 million at a cost of USD 22.53 per tCO_2eq.

Expected total number of beneficiaries

16. The Green BRT Karachi project is expected to directly and indirectly benefit 1.5 million people, who are within 1 km of a BRT station.

Adaptive capacity strengthening impact

17. In addition, the project will provide strengthened adaptive capacity through the improved climate resilience of the BRT infrastructure, primarily through: an increased water retention capacity and slow infiltration; the utilization of lane strips with a median filtration system; the utilization of bioswales along corridors; the adding of drainage capacity; vegetation planted in station verges, a bioswale strip as delineator path; and permeable pavements for pedestrian paths and cycle ways.

18. Accordingly, the impact potential of the proposed programme is assessed as “High”.

1.3 Paradigm shift potential *Scale: High*

Key paradigm shift issues are sumarized below

Potential for scaling up and replication

19. Two novel approaches characterize this BRT scheme and, for replication, these approaches must be included in the replicated projects. These are:

(a) **Use of biomethane in hybrid buses.** Use of biomethane in BRT buses is not new within the global setting; the BRT system in Copenhagen has had 37 articulated biogas buses in place since 2017. Using biomethane in developing country cities for urban buses on a non-pilot scale is an innovation, while combining biomethane with hybrid buses for a BRT system is a world first. Given the scarcity of feedstock for the production of biomethane in cities and metropolitan environments, replication may not be a panacea for all locations. A key attribute of the Green BRT Karachi project is the use of biomethane in a hybrid engine. This combination reduces the quantity of biomethane that would be needed in a non-hybrid system; and

(b) **Implementation of NMT facilities including cycle lanes and e-pedicabs.** This is a unique feature of the Green BRT Karachi project, which offers less carbon-intensive links for passengers who will use the BRT. Since this is integrated into the BRT system, good monitoring of the impact of this approach will allow for improved planning and dissemination in other cities.

20. Replication and scaling up of the Green BRT Karachi project can be achieved at three levels:

(a) **Replication within Karachi.** The project presented in this funding proposal is one of a number of BRT projects already identified as part of the support from JICA for transportation planning for Karachi. From 2008 to 2012, through this support, the Karachi Transportation Improvement Project was developed, comprising of a Transport Master Plan for Karachi, which proposes a mass transit network composed of two metro-rail lines, the revival of the Karachi Circular Railway and six BRT lines, of which the Red, Green and Yellow lines are prioritized for immediate implementation.33 ADB built on this JICA initiative and provided the technical support to design the first Green BRT Karachi system. The Transport Master Plan prepared by JICA includes next to the project line (Red Line), five other BRT lines, two of which are also included for pre-feasibility within this project. Therefore, lessons that will be learned from the successful implementation of the Red Line will be very valuable in the replication of the remaining BRT systems within Karachi's Transport Master Plan;

(b) **Replication in other cities in Pakistan**. The second level of replication will occur in the other cities in Pakistan. Based on the 2017 census Pakistan has 25 cities with more than 250,000 inhabitants and 10 with more than 1 million which could opt for a BRT system. Biogas is available in all cities either from landfills, sewage plants, agro-industries or from animal waste. The success of the Green BRT Karachi project will facilitate the implementation of similar projects in other cities in the country. Given that biogas can be generated in all the cities, lessons learned from the current project will form a sound basis for the planning and implementation of green BRT projects in the other cities in the country. The current project thus has significant national replication potential;

(c) **Replication potential in other countries outside Pakistan**. BRT is being looked at in many cities globally and especially in the Asia region and beyond as a facility to create fuel use efficiency within city transportation systems. Those BRT systems that have been established (e.g. Bogota and Lagos) are based on segregated lanes, with diesel-fuelled and, in some cases, CNG-fuelled buses. Some of the BRT plans have considered electric buses but none have progressed to the use of biomethane as being proposed in the Green BRT Karachi project. Therefore, the successful implementation of the Green BRT Karachi project will provide a sound learning base for the replication of similar projects in the transport networks in cities of other countries;

(d) **Potential for knowledge and learning.** Potential for knowledge and learning from the Green BRT Karachi project has been built into the programme and can be summarized as follows:

(i) High-quality monitoring of impacts of the programme, operational problems and performance in environmental, financial and risk terms has been built into the programme. This will yield high-quality data and information that will become a sound template for knowledge acquisition and learning;

(ii) The process of tendering for the buses and other equipment that will be purchased for the Green BRT Karachi project will include a training component for mechanics on hybrid technology to be provided by the bus supplier(s). Furthermore, training will be provided by the bus suppliers for hybrid bus mechanics as part of the Green BRT Karachi project. The combination of these training programmes with the information and data that will be generated from

[33] JICA. 2012. *The Study for Karachi Transportation Improvement*

the comprehensive monitoring of various components of the Green BRT Karachi project will offer a strong basis for knowledge and learning; and

(iii) The GHG monitoring and reporting unit of the Green BRT Karachi project will produce know-how tools and reports on biogas production for transport, on low-carbon buses and on NMT fostering within urban public transport systems. These knowledge tools will be widely disseminated, hence providing opportunities for learning and knowledge-sharing;

(e) **Contribution to the creation of an enabling environment.** Hybrid buses fuelled by biomethane will be a new initiative within the Pakistan transport system. Although CNG buses are available in the transport network of some cities and diesel plug-in hybrid buses were introduced in the transportation system of the city of Peshawar under ADB funding in 2018, the use of biomethane hybrid buses is a new initiative in Pakistan and the first of its kind globally. Therefore, the successful implementation of the Green BRT Karachi project will generate a knowledge base and information on this new system that will create an enabling environment for the implementation of such projects in the future. Other enabling environment characteristics of the Green BRT Karachi project can be summarized as follows:

(i) The project will deliver the first large-scale biogas facility with its biogas dedicated to use in the transport sector in Pakistan. Although the first commercial-scale biogas plant in Pakistan was inaugurated in 2016, gas produced by such plants is mostly used for power generation. When the biogas facility that will be constructed as part of the Green BRT Karachi programme is operational it will be the first time that gas from such a system has been used in the transportation sector. This is significant given that to use such a gas as fuel in vehicles requires purified or upgraded biogas (with CO2 removed) to natural gas quality (then mostly referred to as “biomethane”), with a high CH4 content (at least 90 per cent) and a low share of impurities. This will create a significant learning curve in the country and create an enabling environment for the assimilation of such technologies;

(ii) The NMT component of the Green BRT Karachi project includes cycle lanes, bicycle-sharing as well as e-pedicabs, which are novel to Pakistan. Therefore, the successful implementation of the project will create an enabling environment in the country upon which future replications can be built. Knowledge from this project will also be available for export to other countries in the region and beyond; and

(iii) The planned climate proofing of the Green BRT Karachi facilities will create a sound enabling environment for an innovative climate resilience intervention. The climate proofing intervention will cover the implementation of bioswale lane strips, which will reduce busway drainage requirements, reduce busway noise levels by approximately 40 per cent and increase green spaces. This kind of work requires a higher level of engineering design and construction and thus a successful implementation of the Green BRT Karachi project will contribute to the development of such high-level engineering performance in the country; and

(f) **Contribution to regulatory framework and policies.** Without the Green BRT Karachi project, the city transport system is characterized by informal and unregulated operations. The implementation of the project will involve the establishment of the Sindh Mass Transit Authority (SMTA) and TransKarachi, two critical institutions that will manage and control the overall quality of the BRT system’s operations and bring a proper regulatory framework and consistent policies to the management and operation

of the transport system. This will contribute to the emergence of a formal, regulated and efficient public transport sector which will allow for the enforcement of relevant sector standards. SMTA and the Transport and Mass-Transit Department of the provincial Government of Sindh will implement an action plan to build a robust financial management system and procurement capacity within TransKarachi as part of this project, which will strengthen the policy framework of the public sector transport system that will emerge once the Green BRT Karachi project is implemented, commissioned and operational within a short period of time.

21. The combination of the following factors has led the independent Technical Advisory Panel (TAP) to conclude that the intervention as planned and submitted for funding does have a high potential for paradigm shift: the potential of the proposed project to enhance the scaling up and replicability of the Green BRT Karachi project beyond the initial coverage to other similar BRT systems in the city and replication to other cities in Pakistan and beyond; the fact that the proposed programme has been developed to provide knowledge-sharing and capacity-building for critical stakeholders; and the fact that the programme will enhance the goals and objectives of the national regulatory framework and policies through improved project management and operation.

22. The independent TAP therefore assessed the paradigm shift potential of the intervention as "High".

1.4 Sustainable development potential *Scale: High*

23. The key sustainable development benefits of the programme are summarized below.

Environmental co-benefits with health implications

24. The switch from the higher-carbon fuels used in the status quo ante transport system to biomethane hybrid buses will have a positive impact on air quality through an average annual reduction in emissions of 5.5 $tPM_{2.5}$, 723 tNO_X and 9.5 tSO_2. The avoided health costs of this reduced air pollution have been estimated to be cumulative USD 7 million (based on the cost of pollutants for Pakistan estimated by the International Monetary Fund).[34] It is expected that the project will also result in reduced noise pollution due to the combination of mode shift, increased usage of NMT and hybrid buses. The daunting problems of waste disposal and environmental degradation posed in the status quo ante situation because of the 7,200 tonnes of manure a day produced at the Karachi cattle colony of about 400,000 animals, the largest in Asia, will be ameliorated by the successful implementation of the Green BRT Karachi project.

25. In the status quo ante situation, out of a total of 3,500 tonnes of animal dung a day, 3,250 tonnes of this waste falls onto concrete floors and 250 tonnes is dropped onto soft ground – to be collected later for use as fertilizer. The waste that falls onto concrete floors is eventually washed into the Arabian Sea through seven main drains using 50,000 tonnes of groundwater and fresh water a day. Besides wastage of a huge quantity of fresh water, this has repercussions for marine life. The dung left on the soft ground produces an unbearable stench and becomes a breeding ground for mosquitoes and other pests.[35] The development of the biogas plant in the project scenario will reduce fresh water usage while massively reducing the discharge of effluents to the Arabian Sea with its negative (from baseline) ecological consequences and reducing problems of odour and mosquitos.

Social and gender co-benefits

[34] International Monetary Fund. 2014. *Getting Energy Prices Right: From Principle to Practice*.
[35] Taken from https://tribune.com.pk/story/1169345/problems-cattle-colony/

26. The social and gender co-benefits that the Green BRT Karachi project will generate can be summarized as follows:

(a) The project will benefit Karachi's estimated population of 14.9 million, 75 per cent of whom are poor or low income, through increased access to safe, reliable and affordable public transport;

(b) The time-saving benefits that will result from the fast throughput of the BRT system and reduced congestion in the mixed mode traffic system has been estimated to amount to about USD 59 million;

(c) Improved traffic management in the BRT system will also lead to significant safety benefits from reduced fatalities and injuries and improved safety for pedestrians and cyclists and a safe boarding and alighting process at bus stops;

(d) The project will engender universal access and safety for women, children and the disabled in all 28 BRT stations and their access routes, including proper lighting and monitoring through closed-circuit television cameras in specific areas of the system, including in buses, and segregated areas for women to reduce their exposure to harassment as has been observed in the status quo ante transport system, and staff trained to deal with harassment incidents;

(e) The use of public transportation system by women and children is expected to increase from the baseline value of 10 per cent to the project scenario of 20 per cent due to all the in-built safety systems incorporated into the project case; and

(f) A strong gender mainstreaming will also be promoted by the project with the policy that at least 10 per cent of the BRT operations employees and TransKarachi staff are women.

Economic co-benefits

27. Key economic co-benefits of this proposed intervention can be summarized as follows:

(a) As stated above, the time savings that will be created as a result of reduced congestion will deliver an economic benefit of about USD 59 million during the lifetime of the project;

(b) Additional economic benefits will also be delivered by savings from vehicle operating costs and environmental health related savings. In total, it has been estimated that all these savings will result in a positive economic internal rate of return for the project; and

(c) Overall the project is expected to generate 2,130 jobs directly through future BRT operations, including 1,424 jobs for station services (such as ticketing, security and cleaning), 615 jobs in bus operations (such as driving, conducting and mechanics) and 81 TransKarachi staff.36

28. A Gender Action Plan has been developed as part of the planning of the Green BRT Karachi project and is expected to included in the implementation of the project. This Gender Action Plan is expected to ensure that a gender-balanced Green BRT Karachi project is achieved not only for this BRT system but also for the replication follow-up projects in Karachi and the other cities in Pakistan.

29. The combination of co-benefits that are expected to be engendered by the successful implementation of the Green BRT Karachi project in Pakistan, which include environmental,

[36] Summary Poverty Reduction and Social Strategy and Gender Action Plan (see Files 4 and 5 in Annex 1 of the Funding Proposal).

social and economic co-benefits, together with the fact that it will provide better livelihoods for women, children and the poor, are sound indicators that the planned programme will result in relatively significant sustainable development.

30. The independent TAP therefore assessed the ADB/GCF funding of the Green BRT Karachi project in Pakistan as "High" on the sustainable development potential metrics.

1.5 Needs of the recipient *Scale: High*

31. The extent to which the needs of Pakistan and the various relevant stakeholders in the country are met are summarized below.

Vulnerability of country and beneficiary groups (adaptation)

32. Pakistan is ranked number seven in the Long-Term Climate Risk Index (1997–2006 averages) with losses amounting to 0.6 per cent of gross domestic product equivalent to USD 3.8 billion.[37] This level of climate risks places a heavy burden on infrastructure planning and development. Particularly important for the BRT infrastructure is its vulnerability to the increase in the severity of future storms with intense precipitation events and an increase in the number of very hot days and heatwaves, which will increase the flooding vulnerability of the system if actions to protect these infrastructure is not included in the design and implementation of the project. Special attention will be paid to the design and construction of an efficient drainage system as an integral part of the BRT infrastructure, including the urban roads, to adapt to this flooding risk.

Financial, economic, social and institutional needs of the country and the affected population

33. Key metrics under this sub-category can be summarized as follows:

(a) The city of Karachi, the largest in Pakistan, has been ranked as one of the world's most unlivable cities, notably because of its high congestion and pollution levels. The status quo ante transportation system, part of which will be replaced by the current intervention, is a major contributor to the city's traffic congestion and poor air quality. The successful implementation of the Green BRT Karachi project will reduce this congestion and reduce the air pollution delivered by the baseline system. It has also been argued that the lessons learned from the successful implementation of the current project will also positively catalyse the replication in other parts of Karachi and other cities in Pakistan and beyond. This will further enhance the reduction of traffic congestion and the pollution inherent in the baseline system. With this, Karachi can be transformed into a city where traffic congestion is gradually reduced as the first BRT system and further BRT replications are built, making the city a more livable city with its attendant improvement in the social life of the city's inhabitants;

(b) Another social improvement that the current project can deliver starting from the successful implementation of the first BRT system and increasingly as further BRT replication is achieved, is the reduction in the average travelling times for commuters and an improvement in the challenging situation faced by women, the elderly, children and the physically disabled in the status quo ante transport system. This will also add to the improvement in the social welfare of these citizens;

(c) Commuter services provided by the status quo ante transport system in Karachi tend to be expensive for the urban poor, as customers must pay again for each transfer between services and modes. Therefore, 40 per cent of all trips are estimated to be still non-

[37] Ekstein D, Künzel V and Schäfer L. 2017. Global Climate Risk Index 2018. Table 2.

motorized, made on foot or bicycles. Karachi's poorest and women would benefit from a well-designed, safe and accessible public transport system such as the one proposed by the Green BRT Karachi project and the subsequent replicates;

(d) Given the weak macroeconomic stability of the Pakistan economy over the last few years, the financial appetite of this economy to assume high risk investments (in terms of probability of being financially profitable) in climate change projects is thus limited and the country relies on grants and concessional loans to cover risk elements and incremental costs of climate related investments. Hence without the GCF concessional funding, it is unlikely that the project as currently conceptualized can be realized. With GCF funding, the possibility of crowding in other debt funding will make the project financially feasible; and

(e) The grant funding that will be provided by GCF will also go a long way to promoting the necessary capacity-building and institutional strengthening required for the creation of a viable and efficient public transportation system in the city of Karachi and other cities in Pakistan. The project implementation under the technical assistance that will be funded by the grant will promote sustainable monitoring and supervising of BRT operations, fiduciary and safeguard activities, monitoring and evaluation, and financial audits.

34. Given that this intervention will have a high score on: improving the climate adaptive capacity of the BRT system; improving the economic and social level of first the affected communities and later the whole country; delivering institutional building and capacity strengthening; and fostering a market that can attract funding from the local private sector and perhaps from overseas sources for the replication projects, TAP believes that the Green BRT Karachi project, if successfully implemented as planned, should greatly satisfy the needs of Pakistan.

35. The independent TAP therefore assessed the need of the recipient as "High".

1.6 Country ownership *Scale: High*

36. Key country ownership metrics that have been identified from the various documents submitted with the request for funding from GCF for the proposed Green BRT Karachi project can be summarized below.

Existence of a national climate strategy and coherence with existing plans and policies

37. Under this item, the following can be summarized as supporting evidence that there is an existing national climate strategy that conforms with the proposed intervention and that the intervention will be coherent with existing plans and policies:

(a) According to the Pakistan nationally determined contribution (NDC), the country plans to reduce up to 20 per cent of the projected 2030 emissions contingent upon the availability of international finance. In the same document, Pakistan's GHG emissions in 2015 are noted as 405 MtCO2eq, of which the energy sector contributes 186 MtCO2eq or 46 per cent. Within the energy sector transport accounts for around 25 per cent of emissions. It is projected that total emissions will increase by 300 per cent to 1,603 MtCO2eq by 2030 with energy-related emissions growing at an average compound annual growth rate of 11 per cent, reaching 898 MtCO2eq by 2030 (representing 56 per cent of total emissions). The request for GCF funding (grant and concessional debt) and debt funding from ADB is consistent with the country's stated NDC objective;

(b) The technology needs assessment document prepared for Pakistan in 2016 identified the implementation of BRT systems as one of the priority technology needs in the

transport sector. The currently proposed Green BRT Karachi project is therefore coherent with that existing strategy and plan; and

(c) The perspective plan Pakistan Vision 2025 recognizes climate change as one of its priority areas. It includes the modernization of transportation as one of its seven pillars. Thus modernization of the status quo transport system in Karachi and other cities in Pakistan through the introduction of green BRT facilities is in line with this national vision.

Capacity of accredited entity and executing entity/entities to deliver results

38. ADB is the accredited entity (AE) for this project. The executing entity for the project will be TransKarachi, with the Government of Pakistan and the Government of Sindh as beneficiaries. The capacity of ADB to serve as the AE for this project can be summarized as follows:

(a) ADB was conceived as a regional financial institution in 1960, with the mandate to be Asian in characteristics and to foster economic growth and cooperation in Asia. To date, ADB has 67 members, of which 48 are from within Asia and the Pacific and 19 from outside. Since 1966, ADB has supported Pakistan with more than USD 27 billion in investments and continues today, with ADB being one of Pakistan's largest and most active development partners. Thus, the organization has experience in funding development activities in Pakistan; and

(b) An ADB Country Partnership Strategy for Pakistan (2015–2019) has been developed for Pakistan by ADB and is designed to support the government in improving connectivity, productivity and access to markets and public services. ADB through this strategy has earmarked a provisional assistance package of at least USD 1.2 billion a year on average, to focus on infrastructure upgrades (mostly infrastructure improvements in the power, transport, agriculture and urban services sectors) and institutional reform. ADB therefore intends to finance the proposed intervention through a loan of USD 422 million. Therefore, ADB not only has experience in the country but also has a clear strategy on how to fund the currently proposed intervention once it has the support of a concessional loan from GCF.

39. The capacity of the Government of Sindh, the Government of Pakistan and its implementation agency TransKarachi, who are expected to act as project executing entity and beneficiary, can be summarized as follows:

(a) The provincial Government of Sindh has within its transport and mass transport department the vision to provide safe, reliable, comfortable and affordable means of transportation to the travelling public of the province by creating an enabling environment for private investment in the sector leading to development and prosperity;

(b) Sindh is one of four provinces of Pakistan with 58 million inhabitants and includes Karachi as its main city. The Government of Sindh has budgeted expenditures for 2017–18 of USD 10.8 billion;

(c) The Government of Pakistan will be providing the counterpart financing of the project worth USD 93 million; and

(d) TransKarachi, the executing entity for this project, is a Greenfield entity that will be financed through allocations earmarked in component 4 funding. Staffing of TransKarachi and its oversight agency, SMTA, has sub-component funding allocations in this intervention, as does the capacity-building training of SMTA and TransKarachi. TransKarachi will implement and own the BRT infrastructure and assets and will be

responsible for BRT operations and management of service contracts, including the biogas plant and the bicycle-sharing facilities. It is expected that TransKarachi will have a staff of 26 persons.

Engagement with the national designated authority, civil society organizations and other relevant stakeholders

40. According to the information provided to TAP in the funding proposal and its various annexes, the environmental impact assessment (EIA) preparation process provided an opportunity for comprehensive stakeholder interaction for the proposed Green BRT Karachi project. Key elements of the engagement of relevant project stakeholders can be summarized as follows:

(a) Public consultation, focus group discussion, targeted meetings and other forms of interaction were used during the process of preparing the project EIA to engage relevant stakeholders;

(b) The formal public hearing for the EIA will provide the next forum for public consultation on the project;

(c) Informal and frequent opportunities for public involvement during the course of construction is expected;

(d) It was stated in the funding proposal that civil service organizations were consulted during the project planning and design stage and will remain part of the ongoing consultative process during the implementation of the project;

(e) It was also stated in the funding proposal that vulnerable poor and low-income groups were consulted during the planning and design of the project. This process is expected to continue through well-established grievance redress mechanisms;

(f) Other relevant modes for the engagement of relevant stakeholders mentioned in the submission include:

  (i) Setting up of reporting centres under the complaint mechanism under TransKarachi to address grievances related to the BRT services, and the safety concerns of women and children;

  (ii) Development of a communication strategy to raise awareness about the BRT services; and

  (iii) Perception surveys will also be carried out to ensure the participation of all segments of the population using BRT services;

(g) The project will not involve the acquisition of private lands and will not damage any adjacent commercial, residential, community or public structures, as the BRT will be constructed within the available width of the existing right of way;

(h) The project will however have significant resettlement impacts on 795 non-titleholder vendors (owners and workers) operating roadside micro-business enterprises. To mitigate, as much as possible, the potential negative resettlement impacts, a proper Resettlement Action Plan has already been put in place; and

(i) The Government of Pakistan through its Ministry of Climate Change (which is also the NDA) registered early in the planning of this project its wish to submit an application to the GCF for a potential grant and concessional financing of the project's climate change components. It also released a letter of no objection for the submission at the appropriate time, and ADB had several discussions with the national designated authority to discuss elements of the financial proposal.

41. All the evidence presented above, which is well documented in the funding proposal and the annexes submitted indicated that there is coherence between the goals and objectives of the Green BRT Karachi project proposed for implementation in Pakistan and the objectives and goals set out in the country's National Climate Strategy as embodied in the country's nationally determined contribution. ADB as the AE for this project not only has very sound experience with working in the various regions of Pakistan, it also has in place relevant funding strategies for the planning, design and implementation of transport sector interventions such as the proposed Green BRT Karachi, and the manner and quality of its engagement with the national designated authority and other stakeholders, points very strongly to sound country ownership characteristics.

42. The independent TAP therefore concludes that country ownership is "High".

1.7 Efficiency and effectiveness *Scale: High*

43. The assessment of the efficiency and effectiveness of the intervention proposed will be discussed along the metrics outlined below.

Cost-effectiveness and efficiency

44. The cost-effectiveness and efficiency of the intervention can be summarized along the following lines:

(a) Investment in BRT and its adjacent infrastructure (e.g. cycle lanes, pedestrianization) are considered as public goods and as such funded by public funds due to its long amortization period (estimated to be about 30 years);

(b) The public investment in the BRT system, the adjacent infrastructure and the biogas facility is done upfront by TransKarachi, which has the full ownership of the project and assets. This strategy helps to provide subsidies for the investment process before turning the business over to private operators, who can then recoup their operational costs with tariffs (in the case of buses) and the sale of biogas (for the biogas facility), without adding on operational subsidies, thereby improving the financial stability of the system;

(c) The intervention recognized that only a few mass transit systems recover their capital costs through revenues alone, especially as fares must be affordable and socially acceptable and as such, private sector participation is considered only for the BRT operation and not for the construction of the system. This will ensure that the tariff is affordable;

(d) This strategy enables the project financial template to ensure the sustainability of the BRT system by avoiding the necessity for operational subsidies;

(e) Revenue-generating parking plazas along the BRT corridor were excluded from the project scope as it has been assessed that these could be financed under a public–private partnership scheme and implemented in parallel with the proposed project;

(f) The GCF funding has been structured to ensure that it does not crowd out other funding sources as follows:

    (i) It is reserved as a concessional loan to cover incremental capital expenses of components which go beyond a standard BRT system but have the potential of being financially profitable. Thus it is reserved for investment in the biogas facility and for the BRT buses;

(ii) The grant from GCF is reserved for investments which are additional to a standard BRT system for costs which are not recovered through additional revenues. This includes bicycle-sharing and e-pedicabs, and adaptation investments; and

(iii) The grant from GCF is also targeted at funding monitoring, reporting and outreach measures which allow for massive replication of the project; and

(g) The efficiency and effectiveness of the proposed GCF funding for this project can be summarized as follows:

(i) Direct GHG impact over the lifetime of the project: 2,610,000 tCO2eq

(ii) GCF investment (in USD): 49.0 million

(iii) GHG abatement cost (in USD/tCO2eq): 19

Co-financing, leveraging and mobilized long-term investments

45. The total fund for the project will be provided according to the following sources:

(a) GCF senior loan with a tenor of 20 years and a concessional interest rate of 0.75 per cent per annum = USD 37.2 million;

(b) GCF grant = USD 11.8 million;

(c) ADB senior loan with a tenor of 25 years and an indicative interest rate of about 3.89 per cent per annum = USD 442.0 million

(d) Grant from the Government of Pakistan = USD 92.5 million

46. Therefore:

(a) Total amount of co-financing (iii + iv) = USD 534.5 million

(b) Total project financing (i + ii +iii +iv) = USD 583.5 million

(c) Co-financing ratio (vi/v) = 10.9

Financial viability of the proposed Green BRT Karachi project

47. Some key parameters that will enhance the financial viability of the project identified in the submission are summarized below:

(a) A high-frequency transit service will replace informal modes of transport travelling in mixed traffic, with fuel-efficient BRT vehicles travelling in segregated lanes at high speeds. As such, In the first year of BRT operations the demand is expected to be 320,000 passengers per day;

(b) By 2021, the high-frequency and efficient transport system will yield savings from vehicle operating costs expected to reach USD 3 million per year;

(c) Time savings benefits for both BRT passengers and the remaining mixed traffic will reach USD 59 million per year; and

(d) Added to these will be safety benefits from reduced fatalities and injuries and reduced emissions that will amount to about USD 16 million per year.

48. Economic analysis of the project showed an economic internal rate of return of 18 per cent, a good indication that the project is economically viable. Sensitivity analyses (20 per cent capital cost overrun, 20 per cent reduction of passenger ridership and a two-year delay in

operationalization) all met the 9 per cent minimum economic yield required for an ADB-financed project.

Application of best practices

49. This project is aligned with all the international best practices for BRT projects, especially those that are classified as "gold standard". It will, however, achieve a standard even better than the gold standard owing to its use of biomethane as a fuel in hybrid buses and the use of bicycle-sharing facilities along its route, thus making it a green project. Key international best practices encompassed in this Green BRT Karachi project can be summarized as follows:

(a) Two-way fully segregated busway infrastructure;

(b) 30-year lifetime pavement;

(c) Modern fare collection system using smart cards to enable distance-based fares;

(d) Bus station level with bus floor;

(e) Flexible operational service planning (several express services, one local and one limited-stop service);

(f) Expected high level of ridership along one of the busiest corridors;

(g) Provision of safe, accessible, comfortable stations;

(h) Establish universal access and safety features for women, children and the disabled in all BRT stations and their access routes, including proper lighting and monitoring through closed-circuit television cameras;

(i) In buses segregated areas for women, and staff trained to deal with harassment incidents;

(j) Careful attention to pedestrian access and integration with other public transport;

(k) Cycle lanes along the corridor and improved sidewalks;

(l) On-street parking and green areas added in various locations;

(m) Last-mile connectivity with 0-emission vehicles;

(n) Heritage preservation through the improvement of historical buildings and pedestrianization along a 2-km section of the common BRT corridor; and

(o) Bicycle-sharing system.

50. Given the discussions above, the independent TAP rated the efficiency and effectiveness metric of the Green BRT Karachi project as "High".

II. Overall remarks from the independent Technical Advisory Panel

51. A key concern of TAP for this project is that the estimated GHG emission reduction may not be achieved as a result of the uncertain fate of the disposal of the sludge from the biogas digester. This issue was discussed extensively with the AE and the Secretariat during the review of the submission by TAP. Following the suggestion from the TAP, the AE agreed to submit a comprehensive Sludge Management Action Plan (SMAP), which will cover: i) mass balance; ii) demand analysis; iii) fertilizer market study; and iv) sludge pool management will provide information on how the sludge will be managed on a daily basis as well as what actions will be taken whenever there is a gap in the demand and supply dynamics of the sludge to be used as fertilizer to the Secretarait prior to the execution of the Funded Activity Agreement and to

report to the GCF annually as part of the annual progress reports on the implementation of the SMAP.

52. TAP therefore recommends that the Board approve the funding of this Green BRT Karachi project.

Independent Technical Advisory Panel's assessment of FP086

Proposal name:	Green Cities Facility
Accredited entity:	European Bank for Reconstruction and Development (EBRD)
Project/programme size:	Large

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: High*

1. Cities and municipalities are critical to delivering climate change mitigation and adaptation action. The most recent Intergovernmental Panel on Climate Change assessment found that urban areas account for approximately 70 per cent of global energy consumption and about three quarters of greenhouse gas (GHG) emissions.38 Cities are a very important part of the world's urban areas. Apart from GHG emissions, much urban infrastructure (including transportation facilities, buildings, energy production facilities, portable water supply facilities, etc.), which are critical attributes of cities, are vulnerable to climate change as they are static. Therefore, the essential nature of these structures can become a weakness if the local ecosystem within which they exist is unable to adapt to climate-induced changes. The GHG emissions from these facilities must therefore be reduced and the resulting green facilities must be rendered resilient to climate impacts.

2. Managers of cities all over the world are faced with the important responsibilities of: providing affordable housing; ensuring that there are adequate transportation (different modes) facilities to cope with growing demand; and ensuring that within cities there is affordable energy that is efficiently available and reliable; among others. Not only must managers source funds to provide for these needs in a cost-effective manner, the climate change realities also require that the facilities provided are "green" and resilient to the negative impacts of climate change. The normal investment needs of cities are significant with municipalities facing budgetary constraints and limited capacity to structure and deliver "bankable" projects. This situation is further exacerbated by the climate investment needs which, in the face of financial constraints that are inherent in many of these countries, make normal financial flows into "climate proofing" almost impossible for city infrastructure projects in the baseline.

3. To address this problem, in this submission the European Bank for Reconstruction and Development (EBRD) proposes to establish a Green City Facility that is designed to address cities' climate change challenges while building the market case for private sector investment in sustainable urban infrastructure. The facility, which will be country driven and evidence based, will prioritize and finance transformational municipal climate-related infrastructure investments. The EBRD Green Cities Facility (hereafter "Facility") is expected to address the climate change challenges described above through the following interventions:

[38] Seto KC. 2014. Human Settlements, Infrastructure and Spatial Planning. In: *Climate Change 2014: Mitigation of Climate Change*. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva, Switzerland, Chap 12, pp 923–1000.

(a) Development of policy and strategic support to cities, which is expected to assist them in prioritizing their climate actions;

(b) Support for the financing of green city infrastructure investments;

(c) Capacity-building for relevant stakeholders; and

(d) Facilitation and provision of a pathway for cities to access green finance and capital markets.

(e) The Facility is expected to focus on urban infrastructure in the following six sectors:

(f) Building energy efficiency;

(g) Water management;

(h) Solid waste;

(i) Public transport;

(j) Municipal energy systems; and

(k) Lighting.

4. EBRD has included an annex in the funding proposal containing confidential information on some of the component projects that have been identified in selected cities in the nine countries covered by this intervention. Information in the confidential annex, which provided the basis for the estimated total project costs as well as the estimated GHG emission reduction, was discussed by the accredited entity (AE) with the independent Technical Advisory Panel (TAP). The AE has also agreed to share the confidential information with GCF Board members.

5. EBRD expects that this intervention will assist the targeted cities to adopt a mixture of policy, regulatory and investment measures and actions that will lead to the reduction of GHG emissions in the six sectors listed in paragraph 4, while enhancing the resilience of urban communities in the targeted city areas to natural disasters and negative impacts of climate change and associated risks.

6. The following is a summary of the elements of the financial structure of the proposed Facility:

- GCF (grant): EUR 48 million (6.4 - 7.1 per cent);
- GCF (senior loan): EUR 180 million (24.1 – 26.7 per cent);
- EBRD (senior loan): EUR 350 million (47 – 52 per cent);
- Donor finance: EUR 8 million (1 – 1.2 per cent);
- Donor grant: EUR 28 million (3.7 – 4.1 per cent);
- Local contribution: EUR 60–130 million (8.9 – 17.4 per cent);
- Total: EUR 674–744 million.

7. As stated in an earlier part of this assessment, a tentative list of projects has been identified covering some of the cities in the region targeted. It is expected that the list will be updated as the programme proceeds, especially as city action plans are developed and confirmed.

8. The methodology utilized and presented in the funding proposal to estimate GHG emissions reduction impacts of this intervention can be summarized as follows:

(a) The calculations utilized for emission reductions drew very much from EBRD experiences with municipal infrastructure projects by sector between 2013 and 2017;

(b) Information from the EBRD business plan and relevant projects in the pipeline for the facilities, especially those in the confidential annex made available by EBRD; and

(c) The emission reductions from each of the Facility's projects within the indicative pipeline were estimated using a model to estimate carbon dioxide equivalent (CO2eq) emission reductions for the Facility's portfolio, drawing from country and sector-specific information as well as historic EBRD performance in municipal and environmental infrastructure investments.

9. Mitigation impacts:

(a) It has been estimated that the interventions by EBRD will yield direct GHG emission reductions of about 576,000 tonnes of carbon dioxide equivalent (tCO2eq) annually;

(b) This will amount to a GHG emission reduction of about 11,023,000 tCO2eq during the Facility's lifetime; and

(c) It is important to point out at this stage that the GHG emissions performance stated in (b) has been estimated using a project list that may not be exhaustive and emission factors by sector that are based on similar project experiences of EBRD. As the Facility implementation proceeds, more exhaustive project lists will be established and local parameters, such as emission factors, will be collated from country and city sources making the estimation of GHG emission reduction impact more reliable. Given the important nature of these performance metrics in the establishment of GCF performance metrics, comprehensive monitoring of the individual projects must be built into the project, and reporting and verification must be included in the operationalization and implementation of the Facility.

10. Adaptation impacts:

(a) Cities that are part of this programme will benefit in terms of having in place: a green city action plan; regulatory and policy reforms that enhance and facilitate climate resilience; targeted technical assistance that will enhance the ability to manage climate adaptive capacity planning; green city infrastructure investment; and gender mainstreaming. All these will promote urban climate resilience;

(b) The entire population of the cities involved will directly and indirectly benefit from this programme. This population has been estimated to be about 22.75 million people, of which about 11.54 million (50.7 per cent) will be women; and

(c) It has also been estimated that the direct beneficiary urban population constitutes about 52.1 per cent of the population in the Facility's urban areas.

11. Accordingly, the impact potential of the proposed framework is assessed as "high".

1.2 Paradigm shift potential *Scale: High*

12. Some of the key paradigm shift issues are summarized below:

Paradigm shift

(a) A theory of change structure that provides logical underpinning of how the proposed facility will engender change was presented in the funding proposal. The structure presented highlights of the relationship between "activities", the main "results" and

"impacts" that will be achieved by the interventions and the resultant paradigm shift because of those activities;

(b) In the absence of the EBRD programme, integrated urban policies and planning will continue along the current status quo pathway without any appreciable penetration of green investment and with an ad hoc approach to urban climate action in the Facility's regions. The programme's key paradigm shift will come from the fact that the Facility will deliver a systematic, integrated, long-term approach to climate action in city and urban planning and management; and

(c) EBRD partnership with GCF is expected to: transform long-term urban and city planning and management by incorporating and generating climate action; provide access to adequate finance thus ensuring that the existing barriers to climate investment are speedily overcome; catalyze the shift to a market for innovative climate technologies, and assist in introducing these technologies to urban programmes for sustainable climate-smart city activities; facilitate access of cities to finance from new sources, particularly from private sector green finance; and provide a greater diversity of options and opportunities for cities to invest in climate solutions.

Potential for scaling up and replicability

(a) The potential for scaling up activities that will be covered by this facility is linked to both the speed with which the demonstration effect of the activities is expected to occur and how the sharing of knowledge generated will be proliferated. It is important to stress that both these effects were well articulated in the submission;

(b) From the EBRD experience with city climate action interventions of this kind, successful climate infrastructure investments usually provide a strong demonstration effect for the uptake and replication of projects and technologies in new regions. It is therefore highly likely that the activities planned under this EBRD intervention will be scalable and replicable;

(c) Sharing of knowledge will be promoted by the Facility in the following ways:

(i) First and foremost, knowledge-sharing in this EBRD intervention will build on two engagements (in Tirana, May 2016, and in Stockholm, June 2018), by implementing annual green city forums in each of the participating cities;

(ii) Secondly, in each participating city, the Facility will hold a minimum of three capacity-building events as part of the green city action plan preparation activities, tailored to the needs of each city; and

(iii) EBRD as a participant in the World Bank Global Platform for Sustainable Cities will provide the Facility's beneficiaries with access to a network of international financial institutions, civil society institutions and other municipal governments focused on fostering sustainable urban development. This will foster further sharing of knowledge;

(d) All these knowledge-sharing activities will foster opportunities for learning and replication for cities both within the Facility's region and beyond;

(e) The introduction of new financial and risk-sharing mechanisms, such as green financing or crop insurance, as well as awareness-raising that will be part of this intervention, has been identified as a possible means of bringing about behavioural change in stakeholders (communities and private sector participants) which, without implementation of the project interventions, would not be possible; and

(f) With knowledge-sharing activities built in to its organization and processes, scaling up and replicability of the Facility should be assured.

Potential for knowledge-sharing and learning

13. Key concepts for knowledge-sharing and learning that are built into the project can be summarized as follows:

(a) A core objective of the Facility is to build the capacity of city officials, municipal companies, representatives of civil society and other relevant stakeholders. This will facilitate knowledge transfer and capacity-building within and between the cities involved;

(b) Technical assistance support and capacity-building of Component 3 of the Facility is at the core of the programme's knowledge-sharing and learning. Elements included in Component 3 expected to catalyse knowledge-sharing can be summarized as follows: development of corporate and city governance strategies; provision of training to improve financial and operational performance of the municipal utility companies; provision of assistance to city and other relevant stakeholder teams on procurement and implementation of climate technologies; training of relevant stakeholders on techniques for monitoring the performance of technologies, post implementation; provision of capacity-building for civil society to enhance their abilities in the areas of community outreach, knowledge dissemination and skills transfer to targeted citizen groups;

(c) The project's outputs include elements related to the dissemination of best available information, technologies and practices and their integration into policies, standards and norms applicable at the national level, thus providing a good avenue for "learning by doing", and creating resource persons for training even beyond the project timeline;

(d) The project implementation will involve the documentation of all project results, including how barriers were addressed and how policy changes were made. This will provide a comprehensive database for knowledge-sharing that will be of use far beyond the project lifetime;

(e) Lessons learned, and results gathered through the project monitoring and evaluation plan will be shared across projects and with project partners and across regional linkages.

Contribution to the creation of an enabling environment

14. Some of the key ways in which the project will create an enabling environment include:

(a) Preparation of Component 1 of the Green City Action Plan will bring together all the critical stakeholders in each city and surrounding metropolis. This will facilitate and ensure the inclusion of views from these stakeholders in the design of the intervention; in addition, it will assist in identifying short-term, detailed action plans for investment, while establishing long-term commitments to sustainable urban development. This process will enable the inclusion of city and municipal priorities and targets in the programme and hence facilitate important buy-ins, which are key to creating an enabling environment;

(b) Private sector actors in the target countries and especially in the target cities and urban areas will be involved in the action plan process and development and hence an enabling environment for the flow of private investment into the programme will be fostered. This will be further enhanced by the provision of infrastructure financing,

especially concessionality of the loan that will be available for investment in green projects within the Facility;

(c) The technical assistance and capacity-building components of the Facility are also expected to contribute to the creation of an enabling environment through the structuring of proper and effective processes in participating cities and the development of human capital that is ready to plan, implement, operate and maintain the green infrastructure;

(d) Climate services will also be created by the Facility that will in turn create an enabling environment for the deployment of innovative low-carbon technologies, and the development of markets for these technologies, green financing and climate risk-sharing mechanisms; and

(e) As part of the technical assistance and capacity-building programme that will be provided to cities under this intervention, institutional reform, corporate development and capacity-building will be important tools in creating an enabling environment for the programme.

Contribution to regulatory framework and policies

15. A key activity in the development or refining of the Green Cities Action Plan will involve working with participating city and national governments to develop and implement appropriate strategic, legislative and regulatory instruments to promote green city actions. The Facility's policy dialogue (Component 1) and technical assistance (Component 3) support will also further contribute to the creation of an enabling policy framework. The green capital market roadmaps (Component 4) will include the identification of actions cities must take to attract private sector finance for climate-focused infrastructures.

16. Accordingly, the overall paradigm shift of the proposed framework for the project, reviewed in paragraphs 13–16 above, has been assessed as "high".

1.3 Sustainable development potential *Scale: High*

17. Some of the wider benefits and priorities that this project will engender to support Sustainable Development Goals (SDGs) are included and described below.

Environmental benefits and co-benefits

18. The product of EBRD interventions in the target cities will be the provision of climate-responsive urban infrastructures and services that generally have direct positive impacts on the health and safety of citizens, as well as on the productivity and environmental sustainability of those cities. The key SDGs and direct environmental benefits and co-benefits that will be enhanced by this intervention can be summarized as follows:

(a) The funding proposal articulated the fact that the intervention will help cities to achieve at least eight of the 17 SDGs. These include: good health and well-being; gender equality; clean water and sanitation; affordable and clean energy; decent work and economic growth; climate resilient infrastructure; sustainable cities and communities; promotion of climate action plans; and building global partnerships for the SDG goals between governments, the private sector and civil society;

(b) The technical assistance that will be provided to city managers and other stakeholders by the intervention is expected to engender better planning and better utilization of resources, which in turn is expected to yield better and more effective delivery of services to city dwellers. As a result, low-income groups, women and

marginalized populations who often lack access to urban services will be socially included and derive greater environmental benefits;

(c) It is expected that the intervention will not only generate employment within participating cities and urban areas, but the targeted vocational training and skills transfer will also contribute to greening the local labour market, creating decent employment opportunities and improving productivity; and

(d) Improvements in air, water and soil quality, all of which are integral to developing greener cities, will be important environmental co-benefits of the Facility.

Gender-sensitive development impact

19. Comprehensive gender issue analysis in each Facility country was presented in the funding proposal. A key conclusion from the gender analysis described in the annex of the funding proposal is that gender issues will be mainstreamed into implementation of the Facility. This will catalyse customer-focused and gender-sensitive inclusion in the delivery of the programmes. Women's access to employment will be promoted by the gender component of the programme, contribute to reducing gender gaps in labour force participation, and promote gender-sensitive economic growth in the target cities and urban areas.

20. Given the discussion of the sustainable development metric, and the extent to which gender aspects have been mainstreamed into the funding proposal, the sustainable development metric of this submission has been assessed as "High".

1.4 Needs of the recipient

Scale: High

Vulnerability of the countries in the target regions

21. All the target regions for the Facility are vulnerable to the impact of climate change. The climate change vulnerabilities of the regions were elucidated in the funding proposal and can be summarized as follows:

(a) In the Central Asian Region, countries are vulnerable to predicted increases in the variability of precipitation and changes in snowmelt patterns that have severe impacts on water availability. Furthermore, seasonal variability and the occurrence of extreme precipitation events lead to flooding and landslides that can have detrimental effects on key infrastructures;

(b) Countries in the Middle East and North African Region suffer from water stress that is known to be exacerbated by climate change. It is also known that water stress in the region is often enhanced by widespread inefficient usage practices and a lack of adequate institutional capacity for effective management. Temperature in the region is also projected to rise with accompanying heat stress and heat waves;

(c) In the Caucasus Region, the projected impacts of climate change are expected to include: shifting precipitation patterns; glacial shrinkage and more variable hydrology, which are expected to have serious implications for water availability in the countries of the region; and

(d) In the region of South-Eastern Europe and Moldova, the Intergovernmental Panel on Climate Change's Fifth Assessment Report predicts future increases in temperatures, increased frequency and extent of drought periods, and a decrease in precipitation patterns.

22. The key consequences of the trends and characteristics described above can be summarized as follows:

(a) Detrimental risks to economic development of countries, many of which rely on adequate water supplies for portable water supply, agricultural irrigation and energy production;

(b) Infrastructure degradation resulting from flooding and landslides;

(c) Significant increase in demand for space cooling and hence an increase in energy demand;

(d) Increase in costs of infrastructure maintenance;

(e) Vulnerable power sector, especially in countries with heavy reliance on hydropower; and

(f) The maintenance of a high level of risk for vulnerable communities and the private sector.

23. It can therefore be concluded that cities in the targeted have a very strong need for the EBRD intervention.

Need for alternative source of financing

24. Local capital markets in all the countries in the target regions lack the capacity to provide funds with the right characteristics for climate technology investments. In some of the countries, even when the quantum of debt and equity are available in the local markets, the debt is usually available at double digit interest rates and very short maturity. Consequently, normal city infrastructure development is constrained by inadequate investment funds. In addition, local financiers and other sources of financing are further discouraged from financing infrastructure projects due to the high upfront costs of clean technologies and the lower tariff structures prevalent in the regions.

25. The proposed Facility will address the issues of limited capital and liquidity that are characteristic of such investments in the targeted cities. The Facility will address the barriers of scarcity of capital and bridging the liquidity gaps, and will introduce concessional loan terms covering interest rates, loan maturity terms, etc. The Facility will address these issues by providing beneficiaries with the financial instruments they need to overcome infrastructure finance barriers that hinder investment from local capital markets, thus engendering the development of needed low-carbon and resilient infrastructures. Through the activities in Component 4, the Facility will help participating municipalities and cities to access wider capital markets for future investment. Green capital market roadmaps will support cities to create an environment that will enable them to attract private sector finance for infrastructure investments by addressing local barriers and aligning investments with green finance opportunities.

Institutional strengthening

26. Municipalities and relevant municipal stakeholders, who otherwise lack the capacities and institutions to raise finance, identify, develop, manage and maintain low-carbon infrastructure projects, will be assisted through the components of the Facility to develop such capabilities. The capacity of these institutions will be built via activities indicated in both Component 3 and Component 4.

27. Given the discussions above, the independent TAP has rated the recipients' need for this project as "high".

1.5 Country ownership *Scale: High*

Existence of a national climate strategy and coherence with existing plans and policies

28. The alignment of this proposed intervention with priorities in each country's national climate strategy is summarized below.

(a) Caucasus Region and Moldova:

(i) Armenia – In the nationally determined contribution (NDC) submitted to the United Nations Framework Convention on Climate Change, Armenia seeks to reduce carbon emissions from transport, urban development and waste management. With respect to adaptation, the most vulnerable sectors to climate change are prioritized as including: water resource management; energy; and human settlements and infrastructures. Other relevant national strategies that are compatible with the plan to carry out green city investment in the country include: Action Plan of the Government of Republic of Armenia, targeted at the National Program on Energy Saving and Renewable Energy (2010); Scaling Up Renewable Energy Program for Armenia (2014);

(ii) Georgia – Georgia has developed a nationally appropriate mitigation action (NAMA) document that focuses on energy efficient public buildings and housing (under development); signed an association agreement with the European Union (EU) in June 2014, which agrees the implementation of critical reforms following EU directives and the requirements of the third energy package; developed the first draft of a National Energy Efficiency Action Plan (2018); is part of the Global Covenant of Mayors for Climate and Energy that aims to reduce GHG emissions by 20 per cent by 2020 while Tbilisi aims to reduce its GHG emissions by 25 per cent with the ambition of becoming the "green capital" of the region; identified the energy and wastes sectors as key to helping the country meet its mitigation goals and in this respect is working with United States Agency for International Development on a low emission development strategy that aims to support climate change mitigation through energy efficiency and clean energy; and

(iii) Moldova – Moldova submitted its NDC to the United Nations Framework Convention on Climate Change in September 2016, committing to a reduction in its GHG emissions to 64–67 per cent below its 1990 baseline level by 2030. In 2014, the country also signed an association agreement with the EU, the central driver of which is the development of a low emissions development strategy. Moldova has also identified reducing emissions in the energy and waste sectors, among others, to meet their mitigation targets. Moldova adopted a Climate Change Adaptation Strategy in 2014 aiming to increase risk management capacity and reduce vulnerabilities in priority areas (agriculture, water, forestry, transport, energy and health) and to increase climate change monitoring capacities through 2020;

(b) Central Asia Region:

(i) Mongolia – Among the country's relevant policy and strategy documents are: the State policy on energy (parliamentary resolution No.63, 2015); 2014 green development policy; National Action Programme on Climate Change (2011–2021); NAMAs (2010); an urban public transport investment programme (2015); midterm new development programme (2010); government resolution No.171, Building Materials Programme (2012);

Mongolian National Livestock Programme (2010). In its NDC, Mongolia aims to reduce its vulnerabilities relating to natural disaster management and water resources. The country has identified a lack of funding and challenges associated with introducing new climate change adaptation technologies as key barriers to overcome; and

(c) Middle East and Africa:

(i) Jordan – Jordan plans to achieve its NDC targets through the implementation of at least 70 projects (14 per cent of its NDC). A significant proportion of these activities are expected to be undertaken in Jordan's cities. Climate change is mainstreamed in both the National Strategy and Action Plan to Combat Desertification (2015–2020), which is aligned with the United Nations Convention to Combat Desertification 10-year strategy, and in the National Biodiversity Strategy and Action Plan (2015-2020). Climate change is also aligned with the global Convention on Biological Diversity 10-year strategy. According to the National Energy Efficiency Action Plan (NEEAP, 2013) and the Jordan 2025 National Vision and Strategy, Jordan planned to increase its renewable energy share to 10 per cent by 2020 and 11 per cent by 2025. On the regulatory front, Jordan has adopted the Renewable Energy and Energy Efficiency Law and Energy Efficiency by-law. Under its NAMA programme, Jordan is seeking assistance to: rehabilitate Al-Akaider landfill; achieve fuel and emissions savings; improve energy efficiency in the water sector, industrial sector and domestic waste management; implement energy efficiency in the water sector, for example Samra Thermal Power Station – Phase III, and the Zarqa river basin industrial waste water treatment plant and energy plant; and

(ii) Tunisia – Tunisia proposes in its NDC to lower its carbon intensity by 41 per cent by 2030, compared to 2010 levels, and estimates a requirement of around USD 20 billion to finance its climate mitigation and adaption measures and capacity-building. In 2014, Tunisia became the third country in the world to address climate change in its constitution, highlighting the challenges of energy supply security. A National Adaptation Strategy was adopted in 2007, as well as the National Forest Strategy and National Strategy on Waste Management 2006–2016. A National Strategy on Climate Change was adopted in 2012, listing a series of adaptation and mitigation measures across various sectors. A new Renewable Energy Law was approved in 2015, and the country is now seeking support for the implementation of the Tunisian Solar Plan, initially formulated in 2009 and redeveloped in 2012. The country's NAMA sets out to achieve the target of 30 per cent of total electricity generated from renewables by 2030, and the technologies include wind, solar photovoltaic and concentrated solar power.

(d) South Eastern Europe Region:

(i) Albania – Albania's NDC sets a baseline target to reduce CO2 emissions by 11.5 per cent by 2030 compared to 2016 levels, with emphasis on strategic sectors including energy and transportation. Albania is a Contracting Party to the Energy Community Secretariat and in this capacity has agreed to align its energy policies with those of the EU. As a result, Albania is implementing parts of EU legislation on climate change and building internal capacity for its implementation. Some of the key focus areas in addition to energy and transportation include energy efficiency in the residential sector and in public sector buildings. In terms of climate change adaptation, Albania has identified

the need to integrate climate change adaptation actions into relevant sector plans, policies and budgets with hydrological systems, agricultural and energy systems, and climate-related hazards as key vulnerabilities with respect to climate change adaptation;

(ii) The Former Yugoslav Republic of Macedonia – The Former Yugoslav Republic of Macedonia is a Contracting Party to the Energy Community Secretariat and in this capacity, has agreed to align its energy policies with those of the EU. The country's NDC is focused on policies and measures to address its climate change goals using measures such as: renewal and improvements of vehicle fleets including electric vehicles; increased adaptation of renewable energy systems; energy efficiency improvements in buildings; and lighting. These measures are projected to lead to a 30–36 per cent reduction in GHG emissions in 2030 compared to 1990 levels; and

(iii) Serbia – Serbia is a Contracting Party to the Energy Community Secretariat and in this capacity has agreed to align its energy policies with those of the EU. The country's NDC is aimed at reducing GHG emission levels by 9.8 per cent below 1990 baseline levels by 2030. Serbia is at an advanced level in alignment of its Energy Efficiency Law and compliancy with the 2010 EU Energy Performance of Buildings Directive.

Evidence for the commitment of cities

(e) Many cities of the countries included in the Facility have signed the Global Covenant of Mayors for Climate and Energy. This is an international alliance of cities and local governments with a shared long-term vision of promoting and supporting voluntary action to combat climate change and move to a low-emission, climate-resilient society;

(f) Fifty-seven cities across the nine countries eligible for the proposed Facility have submitted or had their Sustainable Energy Action Plans accepted by the Global Covenant of Mayors, collectively pledging to reduce CO2 emissions by an average of 22 per cent by 2020 compared to 1990 emission levels.

29. The capacity of EBRD to successfully serve as the AE for this proposed Facility can be summarized as follows:

(a) EBRD has a proven track record of implementing municipal investments in the countries covered by the proposed Facility;

(b) In 2017, EBRD provided finance of EUR 1,043 million to 34 infrastructure projects across more than 30 cities and municipalities, thus contributing to the Green Economy Transition approach of EBDR, led by its Municipal and Environmental Infrastructure team;

(c) These investments ranged from investing in public transport infrastructure, new or upgraded water supply and waste water treatment, energy efficient district heating solutions and municipal solid waste projects;

(d) More than 35 million people are expected to benefit from these initiatives, with a reduction of 863,000 tCO2e per year;

(e) For these infrastructure projects, EBRD was able to muster co-financing from governments, municipal entities, the private sector, international financial institutions and international donor agencies. In 2017 alone, the municipal and environmental

infrastructure projects under EBRD leveraged EUR 2.78 billion of investment in addition to its own finance;

(f) EBRD, through its Municipal and Environmental Infrastructure, has worked on more than 420 projects since it began operating in 1994, bringing very broad experience to bear on the proposed facility as the executing entity; and

(g) EBRD has also established expertise in green city projects and green city action plans, following from the successes of its Green Cities Framework piloted in Yerevan, Tbilisi and Tirana.

30. Engagement with the national designated authority (NDA), civil society organizations and other relevant stakeholders during the planning and design of this project, and scheduled to continue during implementation, can be summarized as follows:

(a) Engagement of the NDA:

(i) EBRD has met and discussed the Facility in detail with GCF focal points and relevant staff in the nine countries included in the proposal through an inclusive process, sustained by EBRD regional offices;

(ii) EBRD received no-objection letters from NDAs in 2017 and has continued to liaise with country focal points while the proposal's components and scope were refined through discussions between GCF and EBRD; and

(iii) EBRD has been working with NDAs and relevant country representatives in 2018 to reaffirm their support for the Facility, and continues these efforts at the time of the first formal submission of this proposal;

(b) Engagement of other stakeholders:

(i) EBRD has obtained an expression of interest for the components of the Facility;

(ii) According to EBRD, it has engaged with a wide range of stakeholders, including local civil society organizations (CSOs), in past urban infrastructure projects. According to EBRD, this is in recognition of the important role of CSOs in raising awareness and stimulating behaviour change; and

(iii) To increase the ability of local CSOs to meaningfully engage in the above processes, a civil society capacity-building component has been included as part of Component 3, technical support and knowledge-building. The CSO component will aim to enhance the technical knowledge and outreach skills of CSOs as well as build institutional capacity to transfer skills through training of trainers.

31. Given the information presented in this section, the TAP has concluded that this submission can be ranked as "high" on the country ownership metrics.

1.6 Efficiency and effectiveness *Scale: High*

32. The economic and financial soundness of the project are considered along the following metrics:

Cost-effectiveness and efficiency

(a) Achieving these metrics depends on the proper and effective design of the Facility's financial structure that addresses the needs of recipients and the various market barriers to infrastructure investment in the regions;

(b) The grant component of the Facility has also been included to achieve the efficiency required by the International Monetary Fund on the concessionality of international finance, together with affordability constraints;

(c) The structure and volume of the Facility has been designed to enable a systemic, regional impact, assisting cities and municipalities to plan around the challenges of climate change (Component 1), while providing financing that reflects the needs and constraints of the Facility's beneficiaries (Component 2);

(d) Technical support and capacity-building (Component 3) have been designed to fill the gap in skills, experience and resources to comprehensively assess the performance of project assets, target urban investments where they are most needed, and address social and economic needs of end-users;

(e) Component 4 of the Facility has been designed to establish the conditions to attract investment beyond the Facility's timeline, by building local capacities to engage with capital markets and leverage private sector finance;

(f) The programme has also been designed to enable the concessionality available from GCF funding to overcome the challenges posed by constrained budgets and limited access to finance by cities. GCF concessional instruments, including grants, will enable cities to scale up their investments in low-carbon, resilient infrastructure linked to comprehensive climate-aligned investment planning; and

(g) All these will be implemented to assure cost-effectiveness and efficiency of the proposed Facility.

Co-financing, leveraging and mobilizing long-term investments

(a) The total volume of the Facility is expected to be EUR 639.2–709.2 million. Of this, the GCF contribution is expected to be about EUR 280 million, accounting for around 32–36 per cent of the total financing required to deliver this Facility;

(b) EBRD, donors and local entities are expected to provide co-financing of EUR 411.2–481.2 million. This is within the scope of EBRD capabilities given its track record. For example, in 2017 alone, EBRD had investments of EUR 1.138 billion across 42 municipal infrastructure projects mobilized EUR 2.78 billion of additional finance; and

(c) It can be concluded from this track record that EBRD should be able to leverage the needed co-financing for this project from its sources once the GCF concessional loan and grant for this facility are approved.

33. The mechanism to ensure financial viability will include:

(a) Proper and comprehensive assessment of the financial viability of each green city project at the selection level. The financial and economic internal rate of returns will be calculated for each project as part of the external due diligence of EBRD;

(b) Principal loan terms and security packages are negotiated on a project-by-project basis to mitigate credit risks;

(c) At least half of green city infrastructure investments will be coupled with recommendations on financial and operational improvement of recipient companies and municipalities to ensure the sustaining impact of green city investments;

(d) Where possible these investments will be coupled with regulatory and tariff reforms to bring systemic impact to the investment environment of green city projects;

(e) The ability to achieve these financial viability metrics hinges on the following:

(i) The track record of the financial soundness of previous EBRD green city infrastructure projects; and

(ii) The planned gradual introduction of cost recovery tariffs during the operation phase of the green city infrastructure, wherever applicable.

Application of best practices

34. Some best practices and their applications are incorporated into the project and can be summarized as follows:

(a) It has been stated in the submission that EBRD is committed to: applying good international practices to managing environmental and social risks and impacts; applying best available techniques to resource efficiency and pollution prevention and control; and seeking to identify opportunities for additional environmental or social benefits. It is understood that these will be implemented in the design and operationalization of this Facility; and

(b) Procurement of public sector operators and consultants to support the implementation of the Facility's components will be governed by the EBRD Procurement Policies and Rules. Procurement for the Facility will reflect the commitment of EBRD to open and competitive procurement processes, in line with international best practices.

35. Given the discussions above, the TAP has rated the efficiency and effectiveness metrics of this project as "high".

II. Overall remarks from the independent TAP

(a) The TAP observes that a programmatic approach requires by nature large financial flows from GCF. As such, we are of the view that any such programme should only be approved if the following provisions are included in the related funded activity agreement:

(i) A condition precedent to all disbursements, other than the first disbursement, that the AE will submit annual performance reports and financial information in accordance with the accreditation master agreement. This report will include the status of each funded activity throughout the relevant reporting period, including a narrative report on implementation progress, based on the logical framework submitted in the funding proposal, and considerations on the ongoing performance of the funded activity against the GCF investment framework criteria. The annual performance report and financial information must be satisfactory to GCF in form and substance, and TAP may require that they include particular areas of reporting, depending on the nature of the programme;

(ii) A condition precedent to all disbursements, other than the first disbursement, that the AE will submit evidence that at least 70 per cent of proceeds previously disbursed by GCF to the AE have been cumulatively committed for the funded activity; and

(iii) A condition precedent to all disbursements that the AE shall provide an indicative pipeline of subprojects expected to reach financial close in the twelve months following the date of the disbursement requested, and confirmation that such projects meet the relevant eligibility criteria for the programme;

(b) We understand that the foregoing provisions are included in the term sheet currently under discussion with EBRD;

(c) The Secretariat informed TAP that for the EBRD Green Cities Programme, the technical assistance components will be funded through two disbursements from GCF and the project financing components will be funded through three disbursements from GCF, each case being a period of up to five years. Funding of disbursements will be subject to satisfaction of the conditions precedent to disbursement set out above. The Secretariat informed the TAP that for the EBRD Green Cities Programme, the reporting period during which annual performance reports will be submitted will be the entire period during which subprojects are being carried out. The annual performance reports submitted by the AE will therefore indicate the status of the funded activity carried out over at least the 12-month period prior to any subsequent disbursement, and will report on the status of the subprojects selected through the EBRD Green Cities Programme;

(d) Based on the above-mentioned points, TAP recommends that the Board should approve this project funding proposal with the following condition[s]:

(i) The AE shall include in each annual performance report an assessment of GHG emission reduction achieved by the funded activity in accordance with the monitoring and reporting methodology described in the operation manual for the Green Cities Programme; and

(ii) The AE shall include in the operations manual for the Green Cities Programme a monitoring and reporting methodology covering GHG emissions reductions brought about by the funded activity.

Independent Technical Advisory Panel's assessment of FP087

Proposal name:	Building livelihood resilience to climate change in the upper basins of Guatemala's highlands
Accredited entity:	International Union of Conservation of Nature (IUCN)
Project/programme size:	Small

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: Medium*

Adaptation impact

1. The project aims at increasing climate change resilience through the implementation of improved land-use practices in the Guatemalan Highlands. These ecosystem-based adaptation (EbA) practices would be focused on improving groundwater recharge and enhancing livelihoods, and would include agroforestry and silvopastoral systems, and the restoration and conservation of natural forests, riparian forests and recharge areas. The project would also include the promotion of rainwater harvesting and the implementation of climate information dissemination systems for agricultural and water management purposes.

2. The EbA concept, a framework for assessing EbA proposals, the relation between EbA practices and water resource management, mechanisms for mainstreaming and implementing EbA practices, and types of EbA practices to be promoted by the project are described in annex 21. EbA practices are broadly divided into agriculture/agroforestry and forestry practices. Agroforestry practices include: (1) the management of combined plantations of timber, fruit trees and annual crops; (2) the establishment of natural windbreaks to protect infrastructure; (3) the use of soil moisture and conservation practices; (4) the establishment of live fences; and (5) the diversification of crops, cultivar types or animal breeds. Forestry activities would include: (1) the conservation or restoration of riparian forests to maintain stream flow under changing rainfall conditions; (2) the conservation or restoration of forests in upland areas to help to prevent erosion and landslides due to extreme weather events; (3) the conservation or restoration of forests in upland areas and key water catchment areas to ensure groundwater recharge and the protection of water sources; and (4) the planting and protection of trees in wetlands to regulate water levels and thus protect nearby fields from flooding.[1]

3. The three main proposed paths to promote and scale up EbA practices are: (1) the mainstreaming of EbA practices into integrated micro-watershed management plans and the provision of tailored training to micro-watershed committees and other watershed management structures; (2) the implementation of a grant facility for small and medium-sized grants for applying EbA practices directly in smallholder farming/agroforestry systems and restoration activities, to be awarded to grass-roots producer organizations and community-based organizations (CBOs); and (3) forestry incentives to be awarded through

[1] Annex 21 of the funding proposal, page 11.

the PROBOSQUE/PINPEP mechanisms[2] to local communities and smallholders who manage, restore or maintain forest lands and agroforestry systems. These activities would be supported by a cross-cutting capacity-building programme[3] and by strengthening the capacities in hydrometeorological data collection, storage, processing, analysis, modelling and targeted dissemination and the development of early warning systems.[4]

4. The InVEST[5] seasonal water yield model would be used to model the impact of EbA practices on reducing flood risk and increasing dry season water flow in the entire project area. The baseline would first be modelled under current land use and then, at project mid-term and end, the seasonal water flow would be modelled again under a new land-use scenario. The difference between both models would provide an indicator of change in both the quickflow (which occurs during or shortly after rain events) and the baseflow, which occurs during dry weather. The model generates maps of the quickflow, baseflow and local recharge.[6]

5. The proposed project expects to establish 7,500 hectares (ha) of agroforestry systems and 15,000 ha of forest restored and managed land to provide hydrological services. It is assumed that the establishment of these improved land-use practices on 22,500 ha would directly benefit 132,000 people.[7]

6. The capacity-building programme aimed at the National Meteorological Authority (INSIVUMEH) and other relevant actors at the community, municipal and national level (activity 3.3) is aimed at institutional strengthening. The programme would cover the operation and maintenance of hydrometeorological stations, data interpretation, modelling and forecasting and good practices related to watershed management.[8]

7. Activity 1.1 includes capacity-building programmes to strengthen the technical capacities of municipal women´s offices and gender offices of the Ministry of Agriculture and Livestock (MAGA), the Ministry of Environment and Natural Resources (MARN), the National Forest Institute (INAB) and the National Council for Protected Areas (CONAP). This activity would also aim at strengthening physical capacity by establishing diversified forestry nurseries and a seed bank to be used for forestry and agroforestry activities.[9]

8. The distinguishing features, main topics, target groups, means of delivery, knowledge flow and didactic materials of the capacity-building programme are described in annex 22. The final design of the programme would be completed by the scientific and technical advisory committee during the first year of the project. Training would be delivered through workshops and meetings, field trips, exchanges (peer to peer, sharing of experiences), short courses, seminars and conferences. [10]

9. The generation and use of climate information in decision-making, through the activities under component 3, focuses on improving the collection, interpretation and dissemination of reliable climate information to be used by agricultural local producers and for water resource management. The project would invest in this component a total of USD

[2] PINPEP stands for “Programa de Incentivos para poseedores de pequeñas extensiones de tierra de vocación forestal o agroforestal”.
[3] Annex 22 of the funding proposal.
[4] Annex 21 of the funding proposal, pages 11 and 12.
[5] InVEST (integrated valuation of ecosystem services and tradeoffs) software has been developed by the Natural Capital Project (<https://www.naturalcapitalproject.org/>) to generate spatial models of ecosystem service. provision at the landscape level.
[6] Funding proposal, page 35.
[7] Funding proposal, page 34.
[8] Funding proposal, page 21.
[9] Funding proposal, page 16.
[10] Annex 22 of the funding proposal, pages 3 and 4.

4.85 million, of which USD 4.4 million would come from the GCF grant. This climate component is composed of three main activities. Activity 3.1 would invest in equipment for data collection, modelling, forecasting and archiving. Activity 3.2 would design and implement a participatory system aimed at improving the accessibility to climate information, allowing local producers to make informed decisions regarding sowing and harvesting and supporting more efficient water management. Activity 3.3 involves a capacity-building programme related to the operation and maintenance of hydrometeorological stations, data interpretation, modelling and forecasting and good practices related to watershed management. This component aims at strengthening the awareness of climate threats and reducing exposure to related risks.[11]

10. Agricultural practices supported by the project would contribute to more diverse livelihoods because agroforestry systems are highly biodiverse systems by definition. This characteristic enhances the adaptation capacity of the productive system, making it more resistant to plagues, and reducing the potential impact of climate events.

11. The increase in groundwater recharge achieved by agroforestry, reforestation and conservation practices would improve resilience against possible drought periods that could be exacerbated by climate change.

12. The project proposes to make use of two different paths for the implementation of the agroforestry systems and restoration and conservation activities: (1) INAB committed to allocate USD 5 million from the ongoing governmental incentive mechanisms PROBOSQUE and PINPEP[12] to be invested in 12,500 ha of the project area, taking into consideration specific climate change adaptation criteria for the selection of beneficiaries; and (2) the project would create a grant facility mechanism to which would be allocated USD 14.8 million (of which USD 8.7 million would come from the GCF grant) destined to be invested in 10,000 ha. Under this mechanism, the project would award grants to CBOs and grass-roots organizations. GCF funds would deliver a minimum of 17 medium grants of a maximum of USD 400,000 and Korea International Cooperation Agency (KOICA) funds would deliver a minimum of 52 small grants of a maximum of USD 45,000.[13]

13. The allocation of funding through these mechanisms would be informed and prioritized by the vulnerability assessments made with the CRiSTAL (Community-based Risk Screening Tool - Adaptation and Livelihoods) and ROAM (Restoration Opportunities Assessment Methodology) methodologies. CRiSTAL is a project-planning tool that supports the design of climate adaptation activities (i.e. adaptation to climate variability and change) at the community level. ROAM was designed by the International Union for Conservation of Nature (IUCN) and the World Resources Institute (WRI) to provide a framework to identify and analyse areas for potential forest landscape restoration and to identify specific priority areas at the national or subnational level.

14. The rationale for the climate-driven information system supporting the logic of the interventions is not clearly indicated in the funding proposal. The criteria for accessing the Grants Facility needs to be reinforced.

1.2 Paradigm shift potential *Scale: High*

[11] Funding proposal, page 21.
[12] PROBOSQUE is a governmental programme which gives incentives to landowners to implement agroforestry and forestry systems and the management of natural forests for the purposes of production and provision of environmental services.
[13] Funding proposal, page 19, paragraph 55.

Innovation

15. Arguably, ecosystem-based adaptation is still an innovative approach in the region. However, this is not the first project of its kind in Guatemala. In fact, the first in Guatemala was the AES CARE project[14], which started in 1989 and included agroforestry and reforestation activities and was designed with a focus on mitigation, to offset carbon dioxide emissions from a new power plant installed in the United States of America. It had a lifespan of 35 years and covered a total of 186,000 ha.[15] Other projects are the Silsoe Aid for Appropriate Development agroforestry project, which started in 2000 and involved the creation of tree nurseries and training on agroforestry (also in the Guatemalan Highlands)[16] and the ongoing Livelihoods Fund/Fundaeco project,[17] which started in 2016 and includes the implementation of agroforestry and reforestation activities on 4,000 ha.

16. In August 2017, GCF approved the Inter-American Development Bank´s "Climate-smart agriculture risk sharing facility for MSMEs" project, which includes the implementation of climate-smart agriculture practices on approximately 200,000 ha in Mexico and Guatemala.

17. In addition, the Government of Guatemala has two ongoing programmes that promote forestry, agroforestry systems and forest management: PINPEP and PROBOSQUE. The design of both programmes contemplated the potential effect of reforestation, conservation and agroforestry systems on climate change adaptability.[18] The Government has invested approximately USD 173 million through these programmes in the last 20 years.[19]

18. The innovative aspect claimed by the proposed project, as opposed to other past and ongoing initiatives, is that investments in improved land-use practices would be designed and developed using an EbA approach, prioritized taking into account water security, hydrological stress and climate change effects. EbA activities would be implemented within the framework of integrated water resource management and lessons learned on watershed management from experiences throughout Central America.[20] For example, the project would provide support for the incorporation of EbA practices into the development of 20 integrated micro-watershed management plans, and it prioritizes water recharge areas and areas with high climate vulnerability. The proposed project is not limited to reforestation and agroforestry practices. It includes financing a wider range of investments such as equipment and technologies for climate-smart agriculture, strengthening technical capacities, experience exchange, small-scale water reservoirs and irrigation systems.

Potential for knowledge and learning

19. The project has a monitoring and evaluation plan that includes a mid-term and a final evaluation, and a yearly internal evaluation, complying with IUCN rules. The Project Management Team would include a project monitoring, evaluation and learning IUCN specialist who would be in charge of the above-mentioned evaluations. The methodologies for evaluation and responsibilities of the IUCN specialist are described in the funding proposal.[21]

20. The project includes a cross-cutting capacity-building programme, described in annex 22 of the funding proposal.

[14] AES: Applied Energy Services. CARE: Canadian Association for Renewable Energies.
[15] Available at <http://www.ipcc.ch/ipccreports/sres/land_use/index.php?idp=253>.
[16] Available at <http://www.jkwouldis.info/3gm2m/katiewouldis/safad/guatea.html>
[17] Available at <http://www.livelihoods.eu/projects/fundaeco-guatemala/>
[18] Decree 51-2010 – PINPEP Law; Decree 2-2015 – PROBOSQUE Law.
[19] Annex 4 of the funding proposal: Additional Letters of Commitment for co financing.
[20] Funding proposal, page 54, paragraph 191.
[21] Funding proposal, page 74.

21. The project would contribute to strengthening the knowledge base and information generation processes through: (a) enhanced capacities of INSIVUMEH; (b) feeding information to MARN; (c) sharing lessons learned with INAB and the Rural Development Learning Centres (CADERs); and (d) the participation of the Institute for Agriculture, Natural Resources and Environment of the University Rafael Landívar (IARNA).

22. The project proposal also includes the generation of knowledge products, including climate forecast reports for target sectors, meteorological and hydrological information systems, toolkits for early warning systems for agricultural practices and water management, capacity-building materials (infographics, videos, training modules) and learning and knowledge materials derived from the internalization of project activities on the study programmes of the University Rafael Landívar.[22]

23. Regarding learning and knowledge management, the project includes the delivery of: (a) 472 workshops under output 1 aimed at the evaluation of EbA activities, strengthening technical capacities of municipal women´s and gender units, consultations to create and strengthen watershed committees and to strengthen the capacities of 4 governmental institutions (INAB, MAGA, MARN, CONAP) and 20 municipalities, and project steering committee meetings; (b) 210 local meetings to train municipal water offices and local committees in water use efficiency; (c) 71 workshops and information sharing meetings related to the implementation of the grant facility mechanism, which would include the evaluation of potential financeable projects; (d) 16 workshops for inter-institutional coordination; and (e) 42 local climate forums to provide information about relevant climatic phenomena such as El Niño.[23]

Contribution to the creation of an enabling environment

24. There are several aspects of the proposal which would support the long-term sustainability of the project outputs: (a) the alignment with national policies on climate change and the participation of MARN; (b) the participation of INAB through the commitment to allocate part of PROBOSQUE/PINPEP funds to the project activities, which would promote the future prioritization within PROBOSQUE/PINPEP of climate change criteria for assigning incentives; (c) the strengthening of the CADERs and existing rural extension services; (d) the capacity-building programme in general, and particularly the training delivered to public institutions (including to the CADERs and agricultural extension workers) on implementing and mainstreaming EbA practices, vulnerability assessments, integrated water resource management and climate information and on the operation and maintenance of meteorological equipment; and (e) the improvement of CBO organizational, financial and operational capacities, enabling future programmes of a similar nature.

25. Beyond project lifespan, operation and maintenance of the newly acquired meteorological equipment would be the responsibility of the benefited institutions.

26. The implementation of agroforestry systems would support the diversification of the local produce market. The success of these agricultural practices would serve as an incentive for the private sector to gradually increase investments in this kind of production systems. Agroforestry systems are often more resistant to plagues than monocultures, which makes it easier to produce without the use of agrochemicals and obtain organic certification. Organic products have a higher market value and better potential for export.

Contribution to the regulatory framework and policies

[22] Funding proposal, page 40.
[23] Annex 20 of the funding proposal: Budget notes GCF KOICA GOG December 14 2017.docx, pages 16 and 30.

27. To help to advance the regulatory framework and policies, the project would support the participatory formulation and updating of instruments for integrated water resource management using a watershed and climate change approach and the watershed management plan and land-use planning using a watershed approach. The project would also work jointly with the two current governmental incentives programmes PINPEP and PROBOSQUE and would support the development of technical normative for the application of the PROBOSQUE law, which is relatively new and still requires instrumentalization.[24]

28. The project also intends to provide assistance on the current discussions regarding the approval of the new Water Law, the updating of the National Climate Change Plan and the issuance of new municipal ordinances to establish rules to regulate watershed management.[25]

29. The activities under output 3 would strengthen the climate information base in the country, thus supporting the mainstreaming of climate change considerations into policies, regulatory frameworks and decision-making processes.

Potential for scaling up and replication

30. The scaling-up potential of the project relies on the demonstration of the benefits derived from the implementation of EbA practices, through the successful development of agroforestry and restoration activities with public (PROBOSQUE) and private (grant facilities) financial mechanisms. The participation in the grant facility mechanism of second-level CBOs, which either work or have associates at the national level and therefore are able to disseminate results and lessons learned, is also crucial for scaling up project activities.

31. All in all, the project has knowledge and capacity-building components that support the replication and scaling-up potential of the project activities.

32. Overall, the paradigm shift potential is considered to be high.

1.3 Sustainable development potential *Scale: Medium*

Environmental co-benefits

33. The environmental co-benefits, which play a key role in this proposal include improved groundwater recharge, reduced vulnerability of watersheds to erosion and flash floods, reduced pollution of watersheds, reduced siltation of riverbeds, improved soil quality, enhanced biodiversity, carbon sequestration and, in general, conservation of ecosystem services.

34. To maximize the benefits of pollution reduction and biodiversity enhancement, it is important that the design of all agricultural EbA activities fulfil the criterion of "livelihood security", as explained in annex 21,[26] regarding the use of local, available and renewable inputs, as in using on-site produced natural pesticides and organic fertilizer, rather than external inputs such as agrochemicals. This consideration would have not only environmental but also social and economic co-benefits. Social co-benefits would involve improved health of farmers and consumers; economic co-benefits are related to the increased value of organically grown agriculture products.

[24] "AE Reply to iTAP assessment Guatemala.docx", page 1.
[25] Funding proposal, page 37, paragraph 107.
[26] Annex 12 of the funding proposal, page 9.

35. Regarding biodiversity enhancement, an important matter which is not clearly mentioned in the description of forestation activities in annex 21[27] is the importance of implementing multi-species forestation practices, with prioritization of native species. The higher the diversity of planted trees, the higher the diversity of insects, animals and understory plants that the ecosystem will be able to support.[28]

36. The total carbon sequestration potential of the proposed project activities was estimated at 2.24 million tonnes of carbon. The sources of the values and calculations used to estimate it are presented in the Financial and Economic Analysis.[29] For the calculation of the carbon storage potential of restored forests, it is assumed that in the baseline scenario, the carbon content of the degraded forests is zero. This is valid only if the baseline ecosystem is a desert. However, if degradation was extreme, this simplification could be valid. Moreover, the passage from extreme degraded lands or cornfields into fully developed agroforestry systems or fully grown and rehabilitated forests is assumed to be completed over 7 years of project lifespan. Yet these ecosystems would take at least 20 years to reach their full carbon storage potential.

Social co-benefits

37. Social co-benefits include increased technical capacities in matters related to resilient agriculture and climate information, increased awareness of climate change effects and adaptation measures, increased availability of sustainable sources of firewood and enhanced water quality and availability, which would have a positive effect on the population's health.

Economic co-benefits

38. The most important economic benefit is the enhanced livelihoods of 82,000 people awarded with grants to implement improved land-use practices. Also, it is expected that the participating CBOs would develop linkages to local and domestic markets, bringing opportunities to engage with value chains and add value to forestry and agroforestry products.[30]

39. By increasing the climate resilience of the local agricultural production system, the project would also contribute to reducing economic losses derived from climatic events and environmental degradation.

Gender-sensitive development impact

40. The project includes considerations to give priority to women-headed households and women's organizations in capacity-building programmes and grant facility mechanism.[31]

41. The proposed project expects that 30 per cent of beneficiaries would be women. This can be justified by the fact that in the project area only 20 per cent of small agricultural producer households are female-headed.[32] The experience of MAGA shows that the baseline participation of women is in the range of 5–10 per cent. An increase of 5 per cent per year of women's participation is expected as a result of project interventions.[33]

[27] Annex 21 of the funding proposal, 4.1 Forestry, page 9.
[28] Larjavaara M. 2018. A review on benefits and disadvantages of tree diversity. *The Open Forest Science Journal*. 1:pp.22–24.
[29] "Financial and economic analysis Altiplano Guatemala may 3.xlsx", sheet "calculo de carbono".
[30] Funding proposal, page 45.
[31] See annex 16b of the funding proposal: Gender Action Plan.
[32] Annex 16a of the funding proposal: Gender Assessment, page 4.
[33] "FINAL ITAP questions and comments dec 2017.docx", p. 7.

1.4 Needs of the recipient *Scale: High*

Vulnerability of the country and region

42. Guatemala is already feeling the impacts of climate change, in the form of frosts and hailstorms occurring out of season and periods of excessive humidity.[34] In the medium to long term (2050–2080), identified threats include increased temperature and variation of precipitation patterns, possibly consisting of a net reduction that could lead to a hydrological deficit. Climate change predictions show an increase in dry and very dry forest areas, and a reduction in humid forests.[35]

43. According to the Global Climate Risk Index, Guatemala is one of the top 10 countries most affected by climate change and one of the most vulnerable to natural disasters.

44. Only 22 per cent of the total project area is covered by forests. Because of deforestation and the uneven topography, the region suffers from severe loss of topsoil and consequent downstream siltation and increased turbidity. Despite the current high water availability, climate change forecasts indicate that the Guatemalan Highlands will be among those suffering greatest hydric stress in the medium and long term. If inadequate management practices and deforestation are not reverted, the ecosystem's capacity to regulate the hydrological cycle will be further reduced, leaving the region more vulnerable to climate change.[36]

45. The effects of climate change on the water cycle would cause several impacts, including reduced yields in agriculture owing to a decrease in water provision in some cases and to excessive rainfall in others, increased vulnerability to flooding and landslides, and potential impacts on hydroelectric generation. [37]

Vulnerable groups

46. The area of influence of the project has a population of over one million, of which 83 per cent was identified as indigenous population.[38]

47. The capacity-building programmes would be delivered in Spanish and four Mayan languages (Quiché, Queqchí, Kaqchikel and Mam), depending on the stakeholders involved in each workshop.[39]

Economic and social development level

48. The project area is one of the most vulnerable to climate risks not only because of environmental conditions but also because of its high social vulnerability. The population is largely rural (70.5 per cent) and 67.5 per cent has agriculture as the main source of income. The area has a poverty rate of over 80 per cent, with 33 per cent living in extreme poverty. Inhabitants also suffer from serious malnutrition issues.40 In four of the five departments of the western highland, delayed growth is prevalent in children under five years of age (more than the national average). Three of those departments have the highest level of growth delay

[34] Annex 2 of the funding proposal: Feasibility Study, page 20.
[35] Funding proposal, page 9.
[36] Funding proposal, page 48, paragraph 146.
[37] There are documented cases of decreases in yield of up to 50 per cent for corn and bean production in dry years and up to 75 per cent in the very rainy years. See annex 2 of the funding proposal :feasibility study, page 25.
[38] Funding proposal, page 47, paragraph 140.
[39] Annex 22 of the funding proposal, page 2.
[40] Funding proposal, page 46.

in the country, and in two of those departments, approximately half of children under five are anaemic. The area ranks among the least developed in the country.

49. The diversification of agriculture is fairly low: 65 per cent of the territory devoted to annual crops is used for corn and 24 per cent for beans. Regarding permanent crops, 75 per cent of the land is devoted to coffee. In terms of total distribution of land use, annual crops take 54 per cent of the surface, natural forests 22 per cent, permanent crops 13 per cent, pastures 5 per cent and protected areas 6 per cent.[41]

Absence of alternative source of financing

50. The absence of other sources of financing is justified by the low economic development level of the population in the project area. Given the predominance of subsistence agriculture, the area is not economically relevant for the Government.

51. The Government is already financing restoration and agroforestry projects through the PINPEP and PROBOSQUE programmes, but falls short on investment needs. In 2015 the Government had difficulties in awarding the incentives and had to delay the payments for several months, causing distress to the rural associations, which mobilized to the capital to claim for the delayed payments.[42]

The need for strengthening institutions and implementation capacity

52. The need to enhance the capacity of MAGA, MARN and INAB is prioritized on Guatemala's National Action Plan on Climate Change. The proposed project would address this need through a series of capacity-building programmes.

1.5 Country ownership *Scale: High*

Alignment with priorities in the country's national climate strategy

53. The funding proposal describes how the project is well aligned with the National Action Plan on Climate Change, the nationally determined contributions and the Forest Policy.

54. Activity 1.2 involves the joint implementation of incentives under ongoing governmental programmes.

Capacity of accredited or executing entities to deliver

55. IUCN (accredited entity) has experience in projects related to biodiversity, climate change, energy, livelihoods and the green economy and has over 20 years of experience in Guatemala. Its experience is described in the funding proposal, demonstrating that the organization has the capacity to handle the proposed project.

56. The capacity of the executing entity (MARN) to deliver is not described in the funding proposal. However, MARN would be implementing the project through Fundación para la Conservación de los Recursos Naturales y Ambiente en Guatemala (FCG) and IARNA. FCG was created in 2000 and to date has managed funds for a total of USD 19 million, including the Tropical Forest Conservation Fund, which approved grants for almost USD 15 million. IARNA is part of the University Rafael Landívar and is a leading institution in climate change information generation and analysis in the country and has experience in research projects related to adaptation of rural communities to climate change impacts. Both FCG and IARNA

[41] Annex 2 of the funding proposal: Feasibility Study, page 35.
[42] Available at <http://www.prensacomunitaria.org/gobierno-de-guatemala-sigue-sin-pagar-la-deuda-millonaria-a-los-beneficiarios-del-pinpep/>.

have sufficient experience and structure to manage the implementation of the proposed project.

Engagement with civil society organizations and other relevant stakeholders

57. The design of the project was carried out by a technical committee which included staff from MARN, MAGA, INAB, IUCN and IARNA.

58. In order to inform and receive feedback from relevant stakeholders during the design phase, consultation activities were carried out which included three workshops with local producers and two workshops with technical staff of government institutions, local municipalities and CBOs. These consultations are described in detail in annex 13. The project expects high stakeholder participation during the design and implementation phases.

1.6 Efficiency and effectiveness *Scale: Medium*

Cost-effectiveness and efficiency

59. On submission of this funding for the nineteenth meeting of the Board (B.19), more than half of the total budget was allocated to personnel; backstopping; travel and accommodation; equipment and supplies (i.e. vehicles and motorcycles, office rental and furniture, etc.); consultancies; monitoring, evaluation and audit; and administration fees; only 43 per cent of the total budget (USD 13.4 million) went to green infrastructure, grants and equipment for climate-related information (i.e. the core of the project). In response to the considerations of the independent Technical Advisory Panel (TAP) about the reduced efficiency of the proposed fund allocation, the budget structure was improved to include, under a total budget of USD 37.7 million, a total allocation of USD 19.4 million to green infrastructure and climate technology, plus USD 3.1 million to capacity-building and knowledge investments (totalling USD 22.5 million, which represents 60 per cent of the total budget).

Economic analysis

60. Based on the assumed costs and benefits presented in the feasibility study and a discount rate of 6 per cent, the economic net present value (NPV) over a 20-year period is estimated at USD 126 million, with an economic internal rate of return (IRR) of 58 per cent. The worst-case scenario of the sensitivity analysis consists on a modest 10 per cent increase in costs and 10 per cent decrease in benefits. This scenario gives an economic NPV of USD 46 million and an economic internal rate of return of 21 per cent.[43]

Amount of co-financing

61. INAB has two ongoing projects consisting of the promotion of forestry and agroforestry systems: PINPEP and PROBOSQUE. Activity 1.2 involves channelling USD 5 million of forest incentives from INAB, to be used on the project target area throughout project lifespan, specifically for the implementation of EbA projects, such as agroforestry systems in agricultural lands and livestock areas, and forest restoration activities in watersheds, riparian forests and recharge areas. The Government of Guatemala would also provide an additional in-kind co-financing of USD 6 million. As the request for GCF financing is for USD 22 million, the Government/GCF co-financing rate is 0.5.

62. KOICA expressed the intention to participate, providing USD 4.55 million in the form of grant financing. The KOICA representative indicated that all staff members who reviewed

[43] "Financial and economic analysis Altiplano Guatemala may3.xlsx." Document received by the iTAP on May 5th.

the proposal are very enthusiastic about its approval and recognize its huge potential to benefit the Guatemalan population. That being said, KOICA funding is still subject to its own project appraisal process and cannot be confirmed yet.44 With the participation of KOICA, GCF would be providing 59 per cent of total funding. Without KOICA funding, GCF share would account for 67 per cent of the total.

63. The lack of the KOICA funding share could significantly undermine the focus of the project on the most vulnerable groups: activity 2.2 (awarding and implementation of small grants for grass-roots organizations), which involves awarding USD 2.3 million in grants for the most vulnerable stakeholders for the implementation of EbA projects, is entirely funded by KOICA.

Application of best practices

64. The application of best practices is based on the knowledge base and experience of IUCN, IARNA and FCG. This is indicated in the funding proposal and consists of the application of approaches, methodologies and tools validated through implementation in Central America, and in particular in Guatemala.[45]

65. The selection of genetic material for the seed bank to be established under activity 1.1 would be informed by traditional knowledge. The development of restoration and agroforestry activities would also consider traditional knowledge and would prioritize the use and conservation of native species.

II. Overall remarks from the independent TAP

66. This proposal presents high impact potential, paradigm shift, country ownership and needs of the recipients. Sustainable development potential and efficiency and effectiveness are assessed as medium.

67. The lack of specificity in the previous project proposal, as expressed under the TAP assessment for B.19, was amended by the proponent through the development and submission of annexes 21 and 22[46] on ecosystem-based adaptation practices and mainstreaming, and the cross-cutting capacity-building programme, respectively.

68. The proposed budget allocation was restructured to reduce the fraction going to staff, consultants, management, vehicles, travel and administrative costs and to increase the share for investments in financial and technological support and social capital and knowledge.

69. iTAP recommends approving this project with the following conditions:

Conditions precedent first disbursement

(a) Provision by the Accredited Entity to the Fund, in form and substance satisfactory to the GCF Secretariat, of a report that demonstrates how the forecasts of the meteorological and hydrological information systems are considered as the criteria in the selection of climate change adaptation activities under the Grants Facility; and

(b) Provision by the Accredited Entity to the Fund of a Grant Facility Manual, in a form and substance satisfactory to the Secretariat, reflecting representation of relevant ministries in the Steering Committee of the Grant Facility.

[44] Annex 4 of the funding proposal: Additional Letters of Commitment for co financing.pdf.
[45] Funding proposal, page 54.
[46] Annexes 21 and 22 of the funding proposal.

70. iTAP recommends that the Evaluation Committee is expanded to include civil society members and academics representing relevant subjects in national universities.

Independent Technical Advisory Panel's assessment of FP088

The funding proposal of FP088 will not be considered by the Board at its twenty-first meeting.

Independent Technical Advisory Panel's assessment of FP089

Proposal name:	Upscaling climate resilience measures in the dry corridor agroecosystems of El Salvador (RECLIMA)
Accredited entity:	Food and Agriculture Organization of the United Nations (FAO)
Project/programme size:	Medium

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: Medium*

1. The objective of the upscaling climate resilience measures in the dry corridor agroecosystems of El Salvador (RECLIMA) project is to improve the livelihood resilience of the vulnerable population in El Salvador's dry corridor to the effects of climate change through adaptive agroecosystem management.

2. The project focuses on improving the resilience of vulnerable family farmers to climate change through an integrated landscape approach that includes (i) the promotion of practical on-farm measures for increasing the resilience of production systems with an emphasis on maize and bean production; (ii) the introduction of household and community-level water harvest and storage systems; and (iii) the maintenance of degraded lands and forest remnants to ensure ecosystem restoration, rehabilitation and conservation of rural landscapes to maintain environmental services.

3. The RECLIMA project will intervene in 114 municipalities that are affected by severe, moderate or weak levels of drought. The municipalities are located in the western, eastern and central areas of the country, representing 64 per cent of total land area. The project states that up to 95 per cent of the slopes in El Salvador are deforested and have lost their primary soil coverage. Combined with monoculture practices, this dynamic has led to severe losses of biodiversity and ecosystem services flows.

4. The project is a cross-cutting mitigation and adaptation scheme. In terms of adaptation, the project will increase the resilience of the livelihoods of 225,000 vulnerable members of family farms in the dry corridor. It is estimated that at least 52 per cent of these people will be women. The project will also provide food security for the families involved and will increase access to a safe water supply for 1,328 families.

5. The project will improve the resilience of ecosystems on 73,933 hectares (ha), including 56,600 ha for the implementation of sustainable agriculture measures, and 17,333 ha for ecosystem restoration measures.

6. In terms of mitigation, the project estimates that integrated landscape management activities involving 73,933 ha could capture 210,842 tonnes of carbon dioxide equivalent (tCO_2eq) per year. Over the entire duration of the project 4,216,835 tCO_2eq could be captured. This is based on the introduction of agroforestry systems, forest tree plantations, improvement of soil conservation and management techniques and more climate-change adapted silvopastoral systems.

7. Restoration/reforestation activities will contribute 73,933 ha towards the nationally determined contribution (NDC) goal of 1 million ha of sustainable landscapes resilient to climate change by 2030 (nearly 8 per cent). The project activities will have significant impact in terms of climate change adaptation, less in terms of mitigation and, in the long run, a significant effect on resilience to climate variability and change in rural communities.

1.2 Paradigm shift potential *Scale: Medium-high*

8. The RECLIMA project involves three different components. The first component, to improve resilience of livelihoods and production systems in family farms, will be centered principally on: (i) promoting the resilience of staple grain production, mainly maize and beans, which constitute the fundamental basis of food security for the target population; and (ii) supporting vegetable and livestock production where these exist. GCF investments under this component will be accompanied by significant co-financing from the Ministry of Agriculture and Livestock (MAG) in the form of technical assistance and agricultural inputs, mainly maize and bean seeds.

9. It is well known that the dependence on two crops will increase vulnerability to climate change. However, the project proponents explain that the cultural tradition of the targeted communities makes them dependent on the production of these two commodities that constitute approximately 60 per cent of their daily diet. What is more important in this project is that vulnerability is also related to the current dependency on hybrid seeds that will gradually be changed to self-pollinated seeds to ensure seed and food security, allowing communities to retain and exchange their own seeds as a fundamental strategy for adaptation. The national centre for research and technology has been developing research on seeds and will be able to produce the necessary varieties for farmers during the lifetime of the project, gradually transitioning away from hybrid varieties. Open pollinated maize varieties are far easier and cheaper to produce than hybrid maize seeds. In addition, open pollinated varieties provide the opportunity for farmers to maintain their best germplasm for planting the following year without in any way compromising yield. Therefore, the paradigm shift is based on this transition to ensure seed and food security, which is a current and ongoing project delivered by the MAG.

10. The specific activities of the proposed GCF intervention are well known and present little innovation. Adaptation practices will include conservation tillage and maintenance of soil cover, contour line trenches and terraces, resilient fodder banks, integrated management of soil fertility, agroforestry and the silvopastoral system, use of staple crop varieties tolerant to heat and water stress as well as drip irrigation.

11. However, part of the paradigm shift embedded in the project aims at shifting the rural development strategy from a predominant focus on soil erosion control and gains in productivity to a strategy that conserves soil moisture and increases resilience, which is a more critical consideration under conditions of climatic variability and change.

12. Diversifying food production is important in terms of climate change adaptation. The project justifies the dependency on maize and beans due to cultural factors and makes an analysis of why other crops are difficult to include in current farm production due to several barriers, including water availability. However, it is important to continue promoting crop diversification considering climate change adaptation. The project proposes supporting vegetable gardens, but there is a need to ensure water availability and local markets that can generate revenue from food surpluses and provide added value to

home garden products. Moreover, while shifting to pollinated seeds for maize and beans, the project will focus on hybrid varieties of vegetables such as tomatoes, sweet peppers, cucumbers, green beans and radishes. The exchange of seeds among farmers should also include pollinated seeds from vegetable gardens.

13. The project will also support the improvement of water collection and management systems in 1,328 households. Providing this system to a few families does not constitute an innovation in itself. Therefore, there is a need to create a scalable strategy to increase the number of families that have water access and at the same time to develop water models that take into consideration sanitation and hygiene practices.

14. The project will strengthen human and institutional capacities on climate-smart agriculture with the support of field schools and will also build the capacity of the Centro Nacional de Tecnología Agropecuaria y Forestal (CENTA) personnel to deliver better extension services. The project will also involve and train young people in climate change.

15. The second component that will increase the resilience of ecosystems and environmental services flows at landscape level includes restoration of vegetation coverage in critical locations, including agreements with private and public land owners and communities. This component is of critical importance to restore the lands. However, the project proposal does not elaborate how to restore lands in selected priority water recharge and production areas. Nor does it explain how to ensure that the communities will be able to appropriate the restored areas and maintenance systems. For example, the project could establish an incentive for conservation by linking the subsidies received by families to their commitment to restore not only their farm but also priority areas of conservation within their basin.

16. The third component, to strengthen local planning, governance and coordination in support of adaptation and restoration, will involve the provision of training and facilitating the understanding of land use plans. This will support planning instruments and governance structures for adaptation and will imply involving community development associations (ADESCOs), cooperatives and other producer associations, entrepreneurship groups, Community Civil Protection Committees, and Municipal Civil Protection Committees. The project will also mainstream adaptation issues into regulatory, policy, planning and incentive instruments at the national level.

17. Although the project is using existing institutions and governance structures, there is a need for strong relationships and arrangements with relevant stakeholders to ensure that they agree to the investments and strategy of the project, and that they will maintain restoration efforts during the lifetime of the project and beyond.

18. The project will also involve the strengthening of information management systems and building capacities to use the information for accurate decision-making.

Potential for knowledge and learning

19. The project will include a component for knowledge-sharing, by supporting the establishment of regional and national platforms for coordination and the sharing of experiences on climate change adaptation. The project will also use field school methodologies to support farmer-to-farmer knowledge-sharing. However, the project does not present a communication strategy for farmers, communities and municipalities, which is always essential as a means of disseminating the project's objectives and transferring knowledge.

20. The way in which the families in the 114 municipalities are selected will be key to promote regional approaches. Connected farms could interact at the farm level, and also at the ecosystem level. The participation of farmers in different training sessions and workshops will result in behavioural change and hopefully produce community commitments to support restoration and reforestation at the landscape and watershed levels. The dissemination of relevant information and best practices will improve understanding of landscape deterioration processes and climate change perspectives and make evident how the sum of individual farm practices would make a significant difference at the landscape level.

21. At the national level, the project will gain access to technical expertise from the Food and Agricultural Organization (FAO) to mainstream climate change adaptation practices in the rural extension services.

Contribution to the creation of an enabling environment

22. The project has the potential to bring about change that is not explicit in the project document. The project proposes deploying USD 58.5 million of government resources to provide maize and bean seeds to producers and ensure the shift from hybrid varieties to pollinated seed, thus ensuring seed security. However, the connection between the proposed project and the governmental project to provide seeds is not developed in the proposal. It is necessary to understand better how the programme to support individual farmers in their sustainable production and yields by providing seeds will complement the project´s technological transfer rationale.

23. The project states that different ministries will coordinate actions and that government institutions will continue to invest in the different activities, but the mechanism ensuring such coordination is not clear. The project also states that access to credit will be facilitated, but the financial schemes are not yet developed nor structured. The project will establish a national technical steering committee and a territorial steering committee to oversee implementation of the project. However, more effective intervention is needed to ensure that the municipalities will mainstream climate change in their municipal plans and that the project is firmly linked to their land use plans and programmes.

24. Ideally, top-down and bottom-up governance approaches need to come together to strengthen local institutions. Efforts should promote solidarity between farmers and include them in defining resource rights and access with a long-term vision of their landscape regeneration approach.

25. The greenhouse gas monitoring, reporting and verification system created for the project must be conceptualized in such a way that it could provide the basis for the national system, adopting the structured methodology used in the project design. A rigorous plan must be developed to evaluate whether the interventions at farm level are effective in improving household well-being and resilience in the long run.

26. Overall, the project must develop a more comprehensive plan in all its components. As presented, the project only provides the objectives but does not elaborate on the means and ways to deliver them.

Contribution to the regulatory framework and policies

27. The project will contribute to the climate change policy and the climate change national plan through the implementation of adaptation and restoration models that could potentially be scaled up to fulfil the NDC.

28. The international agreements signed by the Government of El Salvador, including their NDC, places special emphasis on supporting "sustainable landscapes resilient to climate change". The project will therefore contribute to meeting the targets by developing practical examples at the regional and municipal levels.

29. The project will support the integration of national institutions and policy coherence in approaching landscape management and concrete measures for improved agricultural resilience. The project will help devolve policy implementation to the local level by involving municipalities and community development associations (*asociación de desarrollo comunitaria*, ADESCOs) in climate change adaptation and by developing more integral regulatory action for restoration, agriculture production and water management with relevant governmental institutions.

1.3 Sustainable development potential *Scale: High*

Environmental co-benefits

30. The project promotes an integrated approach encompassing risk management, adaptation and mitigation. Consequently, and by design, it promotes climate-smart practices that will ensure several environmental co-benefits:

(a) Implementation of restoration/reforestation activities in 17,333 ha of degraded ecosystems will promote the protection of water sources and aquifer recharge, at the same time contributing to carbon stocks;

(b) The promotion of community-based and landscape-level environmental governance will protect forest remnants of importance for water supply and reduce the use of fire for land clearance (with the potential of causing landscape-wide wildfires);

(c) The restoration/reforestation activities will restore ecosystem services flows, especially if implemented on a landscape level and/or concentrated in upper watershed with active and passive restoration measures and protection of strategic and fragile ecosystems;

(d) Terracing and run-off capture ditches to promote run-off infiltration and soil moisture recharge involve the construction of terraces reinforced by physical barriers or contour planting (perpendicular to the direction of slope on hillsides, 38,000 ha). These techniques are well known by Salvadorians and have proved to provide significant environmental co-benefits by controlling soil erosion.

(e) Agroforestry systems involve tree planting in association with crop production. This improves connectivity and ecosystem services flows especially if combined with natural regeneration with dispersed trees in fields or in fencelines, pruned and/or pollarded to manage light competition with crops (50,000 ha); and

(f) Silvopastoral systems will reduce temperature stress on livestock and promote run-off infiltration. Dispersed trees in pastures or in fencelines (3,300 ha) will also improve ecological connectivity especially if the implementation strategy is landscape based.

31. The value of these environmental co-benefits is not explicitly nor convincingly articulated in the project. Better information on the connection between restoration efforts in the landscape approach and the efforts to support farms must be provided and more fully developed. In particular, two conditions need to be articulated in greater detail and depth:

(a) If the goal is to design and implement sustainable community-based and landscape-level interventions, the proposed approach needs to include explicitly a strategy to "aggregate and/or cluster" project beneficiaries or farms to (i) create economies of scale, especially important to ensure viability of commercial strategies and market mechanisms; (ii) transfer techniques and know-how through demonstration farms and plots in the same geographic area with greater efficiency and effectiveness than conventional extension efforts; and (iii) invest more efficiently and effectively in off-farm interventions (such as soil conservation and reforestation activities concentrated in the same watershed or catchment area) associated with the flow of ecosystem services to benefit on-farm investments and, in the case of water, remote villages and urban areas; and

(b) design and develop improved agroecosystems and agroforestry interventions with a value-chain approach to ensure that improved resilience also results in greater economic returns and benefits to the producer/farmer.

Social co-benefits

32. Social co-benefits include capacity-building for climate change in rural communities, the involvement of youth in climate change, and the transfer of technologies that will increase knowledge within communities so they are able to adapt to climate change. Here too the project must articulate more explicitly how new farming techniques that improve resilience can be appropriated by the community to ensure long-term sustainability and promote adaptive evolution of new development strategies across wider territories and larger population sectors. Consequently, the project should implement an integrated communication strategy designed to increase awareness and the appropriation of project technologies and know-how by the community (farmers within a cluster) to (i) improve project sustainability over time; (ii) create an environment for innovation, entrepreneurship and leadership within the community (ADESCOs); and (iii) implement a dissemination strategy (using social networks, for example) to make project results available to other communities and thus scale up project interventions effectively and at minimum cost.

Economic co-benefits

33. The economic co-benefits are directly related to the increase in yields of maize and beans. The project expects to generate at least a 30 per cent surplus (above domestic consumption) in the production of maize and beans. It is critical that this surplus be integrated into a value chain approach starting, for example, with promotion of local markets (farmers' markets) and transformation processes at the local level to add value and generate local employment and business opportunities at the community level. Economic co-benefits could also be generated by a more diverse production system (especially in the solares, or home gardens) and even by a more niche-market (unique fruit and vegetables) or trend-oriented production strategy (organic products). These aspects should be articulated explicitly in the extension mechanisms promoted by the project or should at least ensure that these aspects are integrated through the extension packages implemented by other projects.

Gender-sensitive development impact

34. The proposal includes a gender action plan to empower women and to ensure their participation in the project. Women´s participation appears to be a fundamental element of this project implementation strategy. However, the project documents are insufficiently concrete and explicit on how this participation is promoted and sustained over time. Developing and integrating the solares, or home garden production system, into an innovative value chain strategy (including farmers' markets, organic vegetables, "baby vegetables", value added to fruit products, etc.) could involve women and especially female heads of household and their family members leading to significant impact in terms of economic independence, improved nutrition and encouragement of community and business leadership.

Scale: High

1.4 Needs of the recipient

Economic and social development level of the country and vulnerability

35. El Salvador has undergone dramatic transformations. The civil war was accompanied by large-scale emigration. The economy shifted from reliance on agro-businesses to an economy largely driven by remittances. At the same time, there have been both rapid urbanization and growing environmental pressures. The agricultural sector has been severely impacted. This has led to high levels of rural poverty, aggravating the vulnerability of this sector. The sector is also disproportionately affected by environmental problems that directly affect rural livelihoods.

36. At the same time, El Salvador is the second most densely populated country after Haiti. El Salvador suffered droughts in 2001, 2012 and 2014 resulting in losses of USD 31.4 million, USD 38 million and USD 70,1 million, respectively, in agricultural production. The 2014 drought negatively impacted about 103,000 producers located in 105 municipalities. They suffered losses of USD 70.1 million. The MAG estimated that 85,858 ha of maize were lost due to insufficient rain.

37. In 2017, the World Risk Report ranked El Salvador as ninth on its list of 171 countries as relates to risk, exposure, vulnerability, susceptibility, lack of coping capacities and lack of adaptive capacities The Salvadorian population will increasingly feel the effects of the changing climate. Projections by the Economic Commission for Latin America and the Caribbean estimate reductions in water availability for Central America between 35 per cent and 63 per cent. The Intergovernmental Panel on Climate Change predicts that rising temperatures will reduce the country's yields of main crops by 30 per cent by 2050, mainly through recurrent drought. Statistics of this kind alert the country to the current and future climate change conditions.

38. Moreover, the extreme climate events to which El Salvador is exposed presently affect the country with different intensities in the various territories. The dry forest area is particularly vulnerable, with eroded soils and scarce water availability. Landscape restoration initiatives are needed with a multi-sectoral and multi-stakeholder approach. There is a need to promote individual efforts by local farmers and at the same time to promote food security, with diverse productive systems. The project will target small-scale farmers with limited financial and technical knowledge to cope with climate change.

39. Women are particularly vulnerable, facing the day-to-day burden of protecting their families and feeding their children in an adverse environment.

The need for strengthening institutions and implementation capacity

40. Sectoral and territorial institutional planning in El Salvador is complicated, as multiple actors at the national and departmental level have overlapping responsibilities and deficiencies in coordination that make intervention in rural agriculture and development difficult.

41. The project will work at both municipal and community levels with existing institutions that are formally recognized in national legislation with regard to roles, functions and responsibilities, and that have been proven to work and to enjoy social legitimacy. At the national level, the project will support the Ministry of Environment and Natural Resources (Ministerio de Medio Ambiente y Recursos Naturales, MARN) and MAG encouraging joint coordination at the regional level. This is not a simple task, as ministries tend to work in silos, without developing a joint vision on landscape approaches that increase yields, protect the environment and adapt to climate change.

42. At the regional level the project will work directly with 114 municipalities, building land use, watershed development, and food security plans. These municipalities must present annual development plans as well as land use plans. The project will need to engage municipal actors to mainstream climate change within planning instruments and ensure that they are aligned with the proposed landscape interventions and restoration efforts.

43. The project will also work with the associations of municipalities (*mancomunidades*) to empower them and influence the project implementation. Territorial steering committees will work together with staff from MARN and MAG. However, the nature of this work is not clearly stipulated in the proposal.

44. There is a need to work on land use plans that have a landscape rationale. The key factor will be to involve families at the municipal level and municipalities at the territorial level to agree on joint restoration efforts protecting priority areas that will provide environmental services to all. At the same time, it will be necessary to develop agreements to ensure joint actions to maintain restoration efforts; the allocation of municipal budget resources and personnel is crucial for this. Concrete commitments from family beneficiaries as well as municipalities engaged in the project must be established from the very beginning of the project.

45. The principal entry point for the project at community level will be the ADESCO (which is defined as a legal community-based organization) whose objective is to analyse community challenges and needs and promote solutions and development of projects that improve the welfare of the community and its inhabitants (Article 118, Municipal Code of the Republic of El Salvador, 1986).[1] The project rightly points out that ADESCOs have a unique role in local development and governance in El Salvador, as they are groups of community members, and are legally authorized to work to ensure the welfare of their members and promote social and economic development at community level. The project will need to work with ADESCOs and the municipalities to define community priorities based on accurate scientific information to facilitate and ensure appropriate project interventions.

46. To orchestrate real change, the project should work with selected families, ADESCOs and municipalities, and bridge individual, municipal and national needs and

[1] For more detail on the legal basis and functioning of ADESCOs, see <https://ir.library.illinoisstate.edu/cgi/viewcontent.cgi?article=1023&context=cppg>.

opportunities in order to effectively decide on the most effective interventions considering climate change adaptation.

1.5 Country ownership *Scale: High*

Alignment with priorities in the country's national climate change strategy

47. El Salvador has developed a comprehensive climate change strategy that calls for the issues of climate change and variability to be strategically included in development planning and public and private investment, as well as in the principal public policy framework.

48. The project is aligned with the National Environmental Policy of 2012, and the National Environmental Strategy, which sets two broad goals to address climate change by: (i) reducing climate risk in the short term by strengthening systematic climate observation and early warning systems, as well as promoting environmental planning at the local level; and (ii) climate risk reduction in the medium and long term through environmental restoration in degraded rural areas and more resilient productive systems. This project will primarily contribute towards the latter objective.

49. The country has a National Restoration Project with recommendations at the national level that could be followed and completed with the RECLIMA project, applying a special focus to the dry corridor.

50. The project will contribute to the country's NDC under the Paris Agreement, as it has identified a sustainable landscape approach as a priority action for climate change resilience, and aims to establish and manage one million hectares by 2030 through the rehabilitation of forest, agroforestry and low-carbon agricultural practices.

51. The project will seek to mainstream climate change into development plans and policies at the national level, with special emphasis on the integration of adaptation and mitigation in a common protocol between the MARN and the Ministry of Development.

52. The project should create a model of how to mainstream climate change at the municipal level. The municipalities are weak and will need to have a better understanding of their land use plans and the functional connection between protecting and restoring ecosystems and adapting to climate change. The project should be more specific on the arrangements with municipalities, to ensure effective coordination of land use plans considering the broader picture of restoring ecosystem flows in the dry forest corridor of El Salvador.

53. El Salvador is developing its climate change framework law that will be enacted in 2019. The project proposes to enhance regulatory frameworks and enforce the law during the project lifetime.

Capacity of accredited or executing entities to deliver

54. The Food and Agriculture Organization (FAO) as the implementing or accredited entity (AE), has extensive experience in agriculture projects across the world. FAO promotes climate-smart agriculture to increase productivity, adapt and build the resilience of food systems and, wherever possible, reduce GHG emissions. FAO is increasingly supporting projects related to climate change worldwide. In Central America, FAO is

supporting the Climate Smart Agroforestry Systems project for the dry corridor of Central America, supporting farmers in Guatemala and Honduras to increase the uptake of climate resilient agroforestry systems through the "farmer field school" approach.

55. FAO experience in El Salvador builds on a USD 7.9 million climate change adaptation project to reduce soil degradation in fragile watersheds in the municipalities of Texstepeque and Candelaria de la Frontera. This project has tested and developed methodologies and guidelines for cost-efficient climate-change adaptation technologies and practices which have successfully allowed family farmers to increase the climate resilience of their production systems.

56. FAO will use its capacity at the headquarters in Rome as well as the regional office in Chile and the local office in El Salvador, including experts in areas of forestry, natural resources, risk management and climate change.

57. The MAG, including CENTA as the entity providing extension services, and MARN, have experience working together with FAO in the implementation of projects such as the *Amanecer-Rural Land Competitiveness Program* with financing of USD 36.4 million, and the Program to Support Family Farming with financing of USD 60 million.

58. MARN has led the National Program for Ecosystem and Landscape Restoration, which has a national perspective, and will use the current project to develop local interventions for the dry corridor. MARN has important comparative advantages linked to their technical human resources, infrastructure, presence in the territories, and implementation of policies linked to land management, water, forestry, agriculture and climate change. Additionally, they have critical infrastructure necessary for project delivery in the form of specialized laboratories and meteorological stations. MAG has personnel with wide experience and subject expertise, and territorial presence through 40 CENTA agencies, and a presence in 200 municipalities of the country. The technical staff of MAG will support project implementation.

59. The MAG and MARN will manage related initiatives that are presented in the project as co-financing, such as the *Paquete Familia* scheme. In practice however, each ministry is managing its own resources and there is no evidence that coordination arrangements have been developed nor that common activities have been fine-tuned and implemented.

60. The project will work with the Fund for the Americas Initiative (Fondo Iniciativa para las Américas, FIAES), a non-profit organization which catalyses resources with governments, civil society and the private sector to generate transformational change in the sustainable use of natural resources that help climate change adaptation, ensuring well-being and preserving wealth. FIAES will contribute specialists in the restoration of natural areas, resources for nurseries of climate-adapted species and support for participatory diagnoses and sustainable development plans.

Engagement with civil society organizations and other relevant stakeholders

61. The project was developed in consultation with MAG/CENTA, MARN and the Ministry of External Relations. Technical visits were undertaken to 78 of the 114 municipalities, six departmental councils of mayors, three municipal associations and two micro-regions. Workshops with the active participation of potential stakeholders were held throughout the project preparation phase. These consultations focused on direct beneficiaries, civil society, non-governmental and governmental organizations. The project

developed 10 consultation processes in different municipalities involving around 285 people.

62. The project developed a workshop with CENTA to identify approaches for technology transfer. Validation of the proposal was undertaken with the members of the technical steering committee, and with the Environmental Sustainability and Vulnerability Cabinet which is tasked with coordinating efforts and complying with the five-year development plan 2014–2019 on matters of vulnerability reduction and the environment.

1.6 Efficiency and effectiveness *Scale: Medium*

Cost-effectiveness and efficiency

63. The total cost of the project is USD 127,687,738 from which GCF is being asked to provide USD 35,849,612 grant money. The additional USD 91.8 million will be leveraged from three different sources:

(a) Resources from the Paquete Agricola scheme implemented by MAG for a total of USD 74.2 million. USD 58.5 million will be delivered to farmers in the form of maize and bean seeds, USD 9.1 million in technological transfer, and USD 6.1 million in watershed management;

(b) MARN will provide USD 3.7 million. The nature of this investment and the coordination agreement with the current project is not clear; and

(c) FIAES will provide USD 13.8 million. The co-financing letter states that the resources will be devoted to support the conservation area of Imposible-Barra de Santiago; the biosphere reserve Apanema-llamatepec; the conservation area of Los Caobos; the Biosphere reserve Xirihualtique-Jiquilisco; the conservation area of Nahuaterique; and the conservation area of the Golfo de Fonseca. However, the relationship between these and the present project is unclear.

64. Funds from the co-financiers will be managed by MAG, MARN, and FIAES, respectively.

65. In general, it seems from the co-financing agreements that this project is the sum of three different projects, with no clear coordination arrangements or common purposes. The biggest investment is already part of the governmental project known as the *Paquete Agricola* which is managed by the MAG with its own personnel, timing and resources. The project states that the intention is to work in the same municipalities, but it does not explain the activities, coordination mechanisms, joint implementation strategy and logic and the type of joint agreements with the local farmers and communities. The two other co-financers also deliver their own projects, and again, the common objectives and coordination mechanisms to ensure impacts and effectiveness of the investments are not clear in the project proposal.

66. In terms of investments, component 1 to improve resilience of livelihoods and production systems in family farms would absorb most of the investment. It includes the resources invested by the government in the form of maize and bean seeds. This amount includes USD 4.8 million to provide water systems for 1,328 families. The project argues that these systems have been tested in El Salvador leading to “spontaneous scaling up”. The independent Technical Advisory Panel (TAP) believes that this is not adequate evidence that sustainability is ensured and that schemes to scale up water systems should be developed. Moreover, the average price per system is too high and needs to be revised.

Investing resources in tested and accepted technologies must have a greater impact than for just a few fortunate households.

67. Component 2 will invest around USD 23 million in restoration. Given the goals and based on the current deterioration of the dry forest this seems insufficient. Component 3 will invest USD 5.3 million in improved governance and information flow, and USD 6.3 million for project management. The detailed budget shows several investments in office and equipment, including cars and motorcycles, as well as information systems. There should be a proper arrangement with the MAG to build capacity within CENTA and to ensure that the territorial operating units within the project transfer the equipment and capacity to them. The project also allocates around USD 12 million of GCF resources to local consultants, professional and contractual services. There should be a mechanism to ensure proper arrangements with MARN and MAG and the municipalities to ensure proper integration of key personnel in the current institutional structures after project completion.

68. The project estimates an initial rate of return of 15 per cent to 26 per cent over 20 years although the funding lasts only 5 years. According to the proponents, this is equal to an average annual payment of between USD 30/ha and USD 74/ha. This level of income may still be too low to generate revenues that make it worthwhile for farmers to pay for ongoing extension services. The project also estimates that average economic gain per beneficiary would be USD 227 per year based on cost-benefit analysis. This analysis considers the increase in production in climate resilient agricultural systems, with and without the project. The value also includes local ecosystem services and global climate benefits.

69. The project provides a financial analysis over 10 years showing that only one farm category is financially viable. However, beyond a 20-year horizon, the analysis suggests that all farm categories will be financially viable. In the absence of market or financial mechanisms to support farmers, the transition from subsidies in the first five years to self-sustaining models is not clear. The project is proposing a model to increase yields (maize, beans and vegetables) in an adaptive manner. However, the project does not propose mechanisms in the form of value chains and access to markets to support farmers, increase their income and eventually be able to sustain their livelihoods without subsidies. The project also presents the monetary values for each service per biome, including water provision end erosion prevention with estimates of USD 52 and USD 13/ha/year for a total of USD 65/ha/year. Although this is based on a standard methodology, in such a poor area it seems highly unlikely that farmers will value these services so highly.

70. Moreover, the project does not directly propose financial schemes to support farmers. Under its present scope, FAO is an AE only for GCF grant finance. However, the project could make the necessary arrangements with financial institutions to ensure that micro-lending schemes are available, devote some resources to capacity-building to ensure that financial intermediaries understand climate-smart agriculture, and make the arrangements to provide technological transfer with semi-concessional lending options attached.

71. In terms of incremental carbon benefits, the project takes a shadow price of USD 60/tCO_2eq with an annual incremental cost of 2.25 per cent, as proposed by the World Bank, as the social value of carbon. These values do not accrue to the local farmers or even to El Salvador.

72. Finally, in terms of sustainability, the project expects that the municipalities will use their scarce municipal resources to maintain the investments, and that the government of El Salvador will continue investing USD 98 million, after year six. However, the project does not include proof that these future investments will occur. Moreover, if the

investments will continue to supply only beans and maize seeds, without proper investments in ecosystem restoration, the current efforts could prove insufficient and unsustainable to achieve proper landscape restoration with lasting ecosystem services that would benefit current and future farmers.

II. Overall remarks from the independent TAP

73. The independent TAP recommends that the Board approve the project subject to the following conditions to be met prior to the first disbursement:

(a) Delivery by the Accredited Entity, in form and substance satisfactory to the Secretariat, of an action plan developed together with and agreed by MARN and MAG that includes:

(i) Details on how the financing and coordination arrangements for the existing government programmes targeting the same municipalities and beneficiary households as this project, relate to and will complement the project activities as set out in the funding proposal, including the FIAES contribution;

(ii) Details on how complementarity between (A) the existing government "Paquete Agricola" programme to distribute maize and bean seeds and (B) the proposed interventions at family level, will be ensured, including in relation to operational and administrative aspects;

(iii) Details on how the Accredited Entity will develop an unbiased selection mechanism for investments in municipalities and family-level beneficiaries which is based on bio-physical and socio-economic indicators;

(iv) Copies of the draft agreements that municipalities and family-level beneficiaries will be required to enter into pursuant to which: (i) they agree to the project; (ii) commit to their share of responsibilities; and (iii) agree to sustain the relevant interventions after the completion of project implementation;

(v) Details on the landscape-level approach and interventions, providing details on the water and forestry components and which describes how landscape-planning supports adaptation interventions that will generate adequate ecosystem services as set out in the funding proposal;

(vi) A detailed framework and other relevant measure to ensure that municipalities that receive funds under the project work together on their land-use plans to achieve the project's adaptation goals for the dry corridor as set out in the funding proposal; and

(vii) A communication strategy that will effectively transfer technology and knowledge to communities so that they are empowered to sustain their livelihoods.

(b) Delivery by the Accredited Entity, in form and substance satisfactory to the Secretariat, of a revised plan for the water system interventions which: (i) identifies relevant technologies, unit costs, and methods for selection of family-level beneficiaries; (ii) demonstrates that sanitation and hygiene programmes can be implemented simultaneously with drinking water interventions; and (iii) provides evidence that the relevant interventions are sustainable and scalable.

(c) Delivery by the Accredited Entity, in form and substance satisfactory to the Secretariat, of a plan that describes how market and financial mechanisms or arrangements with relevant institutions could be utilized by family-level beneficiaries to sustain their agricultural production and surpluses to increase their income and gradually shift from subsidies to sustainable livelihoods.

74. The independent TAP further recommends that the Board approve the project subject to the following covenant being included in the funded activity agreement:

(a) The plans referred to in paragraphs (a)-(c) above shall be implemented by the Accredited Entity and the other Executing Entities, as relevant, during the project's implementation, and the Accredited Entity shall report on the implementation of such plan as part of the annual performance reports to be submitted by the Accredited Entity to the GCF in accordance with the AMA and FAA.

Independent Technical Advisory Panel's assessment of FP090

Proposal name:	Tonga Renewable Energy Renewable Energy Project under the Pacific Islands Renewable Energy Investment Program
Accredited entity:	Asian Development Bank (ADB)
Project/programme size:	Medium

III. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: High*

1. Tonga is a small island developing State (SIDS) consisting of about 177 islands, with a total area of 748 square kilometres. About 103,000 inhabitants live in Tonga with about 75 per cent of the population living on the island of Tongatapu.

2. Power demand in Tonga is almost entirely met through power generation using diesel as fuel. Recently, however, some renewable power content has been added to its power generation mix. Nevertheless, because Tonga is extremely remote from all markets and most resources, including fossil fuels, it has had to rely entirely on diesel imports to meet a substantial portion of its electricity demand.

3. Apart from this import dependence, which has negatively impacted Tonga's balance of trade, burning diesel to generate power in Tonga also carries with it climate change concerns. The financial burden of having to import diesel for electricity generation has resulted in high costs for electricity generation. This has translated into high power tariffs in the country and thus to limited electricity consumption.

4. Although Tonga has great potential for renewable energy, notably from solar, wind and biomass, financial, technical and other barriers have constrained the development of renewable energies. To address this situation, the Government of Tonga issued the Renewable Energy Act in 2008 and then formulated the Tonga Energy Road Map 2010–2020 (TERM) to catalyse the country's development of its renewable energy endowment.

5. In addition, the Government of Tonga recently released the details of its nationally determined contribution (NDC) with the following renewable energy targets:

(a) Fifty per cent of all electricity in Tonga to be generated from renewable energy resources by the year 2020; and

(b) Seventy per cent of all electricity in Tonga to be generated from renewable energy resources by the year 2030.

6. To achieve these targets or, more importantly, to assure that the country will be on the path to achieving these targets, the Government of Tonga put in place a phased implementation strategy, of which the first two phases have been implemented or are nearly completing implementation (see below):

(a) Phase 1: 2009–2019 – Outer Island Renewable Energy Project (OIREP), which:

(i) Covers nine outer islands;

(ii) Involves power distribution network upgrades; and

(iii) Receives funding from a combination of sources, including the Asian Development Bank (ADB), the Global Environment Facility (GEF), the Government of Australia, the Government of Denmark, the Government of Tonga and the European Union;

(b) Phase 2: 2017–2019 – This phase is made up of the following components:

(i) Solar independent power producers (IPPs); and

(ii) Two wind farms to be funded by the Japan International Cooperation Agency (JICA) and the Government of China;

(c) Phase 3: 2018–2020 with the following components:

(i) Tonga Renewable Energy Project (TREP); and

(ii) Two wind farms to be funded by JICA and the Government of China;

(d) Tonga Energy Efficiency Target – This was put together to complement the three phases with the goal of reducing grid power losses, which were as high as 18 per cent in 2010, to 9 per cent by 2020. This programme is made up of the following components:

(i) Completed phase: covering the Cyclone Ian Recovery Project, which rehabilitated the Tonga Power Limited (TPL) grid (completed in 2015);

(ii) Partly ongoing phase: consisting of work on two grids – ʻEua (completed) and Vavaʻu (ongoing) – and the Smart Metering Project; and

(iii) Programme planned for after 2020, covering the Nukuʻalofa Network Upgrade Project and the Battery Energy Storage System (BESS).

7. The key characteristics of this phased strategy put in place by the Government of Tonga can be summarized as follows:

(a) The first two phases of TERM are under implementation. When these phases are completed, approximately 27 per cent of Tonga's electricity will be generated from renewable energy resources; and

(b) Building on this, the proposed project – the TREP component of Phase 3, which is the focus of this current funding proposal and which will be funded in part by GCF – will play a major role in implementing Phase 3 of TERM in its entirety, thereby helping Tonga meet its NDC target in 2020 and firmly placing the country on the path to achieve its 2050 targets.

8. The key components of activities that will be undertaken under TREP can be summarized as follows:

(a) Installation of a 10.1 megawatt (MW)/22.2 megawatt hour (MWh) stand-alone BESS. This is expected to:

(i) Ameliorate the fluctuating availability of solar energy, which has been a key barrier to being able to integrate solar power in the grid; and

(ii) Through the removal of this barrier, spark the otherwise sluggish engagement of private sector investment in renewable energy power to the grid;

(b) Installation of 1.15 MW of renewable energy generation capacity in the outer islands, to be coupled with their associated BESS;

(c) Building of a mini-grid system in the outer islands to bring electricity generated from a renewable energy-based hybrid system to consumers; and

(d) Capacity-building for the Government of Tonga and the public sector utility TPL covering (a) planning and development of Renewable Energy Power Systems (REPS) including BESS; (b) operations and maintenance (O&M) of the REPS; (c) planning and management of power tariffs for power purchase agreements (PPAs) for private sector-funded investments; and (d) gender mainstreaming and community engagement.

9. Apart from delivering clean energy to consumers in Tonga, the TREP is expected to do the following:

(a) Make a major contribution to Tonga's NDC target of generating 50 per cent of its electricity from renewables by 2020 and help Tonga build momentum to achieve 70 per cent by 2030;

(b) Directly generate about 3 per cent more clean electricity in the outer islands;

(c) Allow for an increase in renewable energy generation by about 7.8 MW (4 MW solar photovoltaic (PV) and 3.8 MW wind power) through the BESS, which will be funded by the private sector;

(d) Enable Tonga to increase their renewable energy penetration by 24 per cent without negatively affecting the grid; and

(e) Help TPL, through the BESS system on Tongatapu, meet the Government of Tonga's NDC target of reducing electricity line losses to 9 per cent by 2020 (from a baseline of 18 percent in 2010).

10. The following is a summary of the financial structure of the proposed TREP:

- GCF (grant): USD 29.90 million (56.2 per cent);
- ADB (grant): USD 12.20 million (22.9 per cent);
- Government of Tonga: USD 5.60 million (10.5 per cent);
- TPL: USD 3.00 million (5.6 per cent); and
- Government of Australia (grant): USD 2.50 million (4.7 per cent);
- **Total: USD 53.20 million.**

11. The following reasons were presented in the funding proposal as to why the Government of Tonga has requested grant financing for this project:

(a) The Government of Tonga has very limited revenue sources and no means of increasing revenue to finance the required investments for TREP;

(b) Commercial financing is very limited in Tonga and the existing financial environment in the country is not suitable to attract investment from the private sector;

(c) BESS, a key technology of the intervention, is not considered a suitable stand-alone technology for private-sector investment. It is a means to an end, required to be in place to complement multiple power supply facilities, and may not be technically feasible in all cases, for example for renewable energy technologies, because of its

intermittency. In such cases, BESS will serve to ensure that power quality is maintained at an acceptable level that will enhance grid stability and integrity;

(d) The small-scale nature of renewable energy power facilities needed on the outer islands is not attractive to private sector investors, who are usually looking for economies of scale to enhance return on investment; and

(e) GCF grant funding is therefore seen as the only available financing option to introduce financing at scale to overcome the initial renewable energy investment hurdle.

12. The methodology utilized and presented in the funding proposal to estimate the greenhouse gas (GHG) emission reduction impacts of this intervention can be summarized as follows:

(a) Given the fact that BESS is not a generation technology but a storage device, an estimation of the project impact on reducing diesel use up to and including the year 2020 was estimated;

(b) The following estimation assumptions were made to calculate the annual savings in diesel generation that will be recorded as a result of the project:

(i) Under the baseline scenario (current mix of power generation), the total diesel generation for the 2020 forecast load was estimated as 53.28 gigawatt hours (GWh);

(ii) Once installed, the renewable energy technologies will be used to the maximum extent possible. Some of the existing diesel generators on Tongatapu, 'Eua and Vava'u will be decommissioned or used less frequently. The remainder will be used to provide some baseload power and for grid stability. In the outer islands, diesel generators will be used as backup;

(iii) The annual average generation resulting from renewable energy subproject investments to be made under this project are estimated using standard plant load factors for solar PV (17 per cent, including performance degradation over time) and wind farms (30 per cent); and

(iv) The BESS on Tongatapu will enable the provision of an additional 6.139 MWh annually from renewables to be provided to the grid by mitigating the curtailment currently applied.

(c) On the basis of the assumptions elucidated above, the total diesel generation for the 2020 forecast load will be reduced to about 35.78 GWh. Thus, the project intervention will result in an annual reduction in diesel generation of about 17.50 GWh; and

(d) The GHG emission factor for diesel generation has been calculated as 0.7780 tonnes of carbon dioxide equivalent (tCO_2eq) per kilowatt hour (KWh).

(e) Mitigation impacts:

(f) It has been estimated that the interventions resulting from TREP will yield direct GHG emission reductions of about 13,616 tCO_2eq annually;

(g) This will amount to GHG emission reductions of about 340,395 tCO_2eq during the facility's 25 years lifetime;

(h) TREP will reduce global emissions by an estimated 340,395 tCO_2eq for a total GCF investment of USD 29.90 million at a cost of USD 87.80 per tCO_2eq. This compares favourably to the Cook Islands BESS project approved under the Pacific Islands Renewable Energy Investment Programme at the fifteenth meeting of the Board of the

GCF (with a rate of USD 167 per tCO2eq), and the recent solar power development project in the Solomon Islands (with a rate of USD 724 per tCO2eq).

13. Adaptation impacts:

(a) Although it is weakly stated in the submission, TREP will consist of a project element that will result in climate proofing the energy facilities that will be implemented. This will strengthen climate resilience in the SIDS of Tonga and contribute to sustainability;

(b) Approximately 95,000 people living in Tongatapu, 'Eua and Vava'u will benefit from clean, reliable and affordable electricity supplies, a substantially increasing portion of which will be generated from renewable energy technologies. Of these beneficiaries, 49.7 per cent will be women;

(c) A total of about 1,059 people on the outer islands on Ha'apai and Niuas will also benefit from a longer, reliable, modern electricity supply at a lower cost; and

(d) TREP will also help to greatly increase access to electricity for marginalized populations in the outer islands, where access is currently very low. Additional clean energy will be delivered via TREP to these marginalized communities.

14. Accordingly, the impact potential of the proposed framework is assessed as High.

1.2 Paradigm shift potential *Scale: High*

15. Some of the key paradigm shift issues are summarized below:

(a) **Paradigm shift:**

(i) The dependence of power generation on diesel as fuel is currently as high as 90 per cent in much of Tonga. Given the fact that diesel is 100 per cent imported, this has constituted a very high pressure on balance of trade. Tonga's current reliance on imported oil, which supplies all transport fuel, much of the energy for water pumping, and, as mentioned above, about 90 per cent of grid-supplied electricity. As a result, the Tongan economy and hence electricity consumers have been exposed to high and volatile electricity prices over the years linked to the international crude oil prices. Reducing this impact through diversification away from imported resources (oil products) to the use of indigenous resources will deliver a great paradigm shift for Tonga;

(ii) In the absence of this TREP intervention, electricity generation in Tonga will continue to be dominated by diesel fuel with its high GHG emissions and contribution to global warming. Although the relative size of GHG emissions from Tonga is small compared to other nations, the TREP programme will deliver a paradigm shift that Tongans will be proud of in that they will contribute to global effort to reduce GHG emissions;

(iii) The increasing frequency of strong destructive tropical cyclones has affected Tonga's development with damages costing 20 per cent of gross domestic product on average. Coupled with this is the increasing coastal erosion, which is also costly for Tonga. These occurrences also have a debilitating effect on the reliability of the power supply during the events. Power generation stations are knocked off from operations, while power distribution becomes impossible. One of the TREP interventions includes the climate proofing of the

renewable energy facilities (including the BESS) that will be installed. This will ensure power is still available to consumers during these events;

(iv) Thus, TREP has been designed to address the dual challenges of climate change and energy security. TREP will assist Tonga to achieve the paradigm shift from high dependence on fossil fuel for its electricity generation to the more climate-friendly and clean renewable energy power;

(v) Another key paradigm shift is the increased use of BESS within Tonga's electricity supply system. The stability of electricity grids can be negatively impacted when fluctuating resources like the renewable energy power sources are connected. The instability generated can eventually lead to a collapse of the grid and hence a loss of power supply. The development of BESS at the level planned in TREP for Tonga's electric supply system will help to reduce the negative impacts of a fluctuating source while at the same time making excess production of renewable energy power available in a grid;

(vi) An important predicted paradigm shift resulting from the increased utilization of BESS within the Tonga Electricity Supply System (TESS) is the creation of the right system environment that will enable the inflow of private sector funding into the TESS. It is expected that the situation created will attract private funding into IPPs, who will build the renewable energy power systems required to accelerate the path towards the goals that the Government of Tonga has set for 2020 and 2030 as far as renewable energy penetration into TESS is concerned;

(vii) Another key paradigm shift that will be brought to TESS through the implementation of TREP is the fact that the technical assistance grant will be used to prepare the Government of Tonga as well as the public utility TPL to learn and implement strategies for a more commercially oriented operation of the electricity supply assets in Tonga. Prior to this TREP, TPL, like many other power utilities in the Pacific, has not been allowed to pass through their generation assets grant-financed by many development partners to consumers and charge a commercial tariff. Under TREP, TPL staff will be trained on how to (i) set a commercially oriented tariff; and (ii) prepare sound PPAs that will be put in place with IPPs, who will invest in the renewable energy systems. This will help TPL – Tonga's only government-owned power utility – operate and maintain all the grant-funded BESS and renewable energy generation assets in a more commercially oriented way.

(b) **Potential for scaling up:**

(i) A common feature for countries in the Pacific island region like Tonga is that it is a generally accepted fact that renewable energy power will play a role in their future resilient electricity supplies. The barriers that must be broken for this to happen and the types of solutions that will need to be put in place in these countries are also common;

(ii) The TREP initiative in Tonga is taking place within the Pacific Islands Renewable Energy Investment Program (PIRIEP – FP036), an earlier project approved under the GCF process (in December 2016) for the Cook Islands that had a focus on BESS. It is very likely that the planning of the BESS component of the TREP followed a similar learning curve as PIRIEP, and that the implementation and O&M of the system under TREP has also learned some lessons from PIRIEP. This is the essential building block for scaling up that will be established in the planning of similar systems in the other countries in the

Pacific island region, and will include lessons on the institutional and capacity-support mechanisms;

(iii) Knowledge-sharing activities built into PIRIEP and also the TREP interventions will foster opportunities for learning and replication for countries in the Pacific region and beyond.

(c) **Potential for knowledge-sharing and learning:**

Key concepts for knowledge-sharing and learning that are built into the project can be summarized as follows:

(i) TREP is taking off after the successful approval of the PIRIEP intervention in the Cook Islands, which was designed to generate lesson learned for countries in the region, including Tonga;

(ii) Sharing of knowledge will be promoted in the region; this was first engendered by the earlier PIRIEP project in the following ways:

- Lessons learned from the PIRIEP intervention, which will be incorporated into the TREP project. They will facilitate the quick scaling up of approaches in not only Tonga but in countries such as the Marshall Islands, Micronesia (Federated States of), Nauru, Papua New Guinea and Samoa, which will also be able to develop BESS in addition to implementing renewable energy generation options;
- Sharing of experiences at the annual ADB Asia Clean Energy Forum and the Pacific Power Association Conference;
- Provision of opportunities for inter-island visits to observe successes and lesson learned, including knowledge-sharing workshops; and
- Cooperation with regional stakeholders and regional coordination bodies.

(d) **Contribution to the creation of an enabling environment:**

Some of the key ways in which the project will create an enabling environment include:

(i) TREP will further enhance the following initial steps that had been taken by the Government of Tonga to create an enabling environment for the power sector in Tonga;

- Through the Renewable Energy Act of 2008 and TERM introduced in 2009, the Government of Tonga took steps to strengthen its enabling environment for energy production in Tonga. Steps taken included comprehensive measures to update policy, legal and regulatory arrangements; and
- By facilitating and enabling the government-owned utility TPL to strengthen its capabilities to operate and maintain power facilities within TESS;

(ii) This enabling environment created by the Government of Tonga before the development of TREP will be further enhanced in the following ways:

- Continuous assessment of the existing enabling environment under TREP Project Output 4;

- Under PIRIEP, which has a regional technical assistance component that will also support the intervention in Tonga;
- TREP will further strengthen the enabling environment to attract additional public and private finance through: (i) raising of awareness and confidence in renewables; (ii) provision of training and on-the-job experience to TPL and the Ministry of Meteorology, Energy, Information, Disaster Management, Climate Change and Communications (MEIDECC), which is expected to lead to a strong cadre of personnel who will be able to facilitate successful investments in renewable energies; (iii) the foundational investment in BESS, a necessary technical development that will enhance the integrity of the grid as well as open the door for the flow of IPP investment in TESS; and (iv) support for potential IPP transactions and areas for IPP involvement (e.g. drafting and/or reviewing PPAs to be entered into with IPPs).

(iii) These will create the necessary enabling environment for the growth of TESS and the ability of Tonga to meet its NDC targets for 2020 and 2030.

(e) **Contribution to regulatory framework and policies:**

(i) The Government of Tonga, prior to the development of the TREP intervention, has implemented a few regulatory and policy frameworks and policies geared towards a better and effective delivery of services from TESS. Three newer initiatives to be delivered by TREP that will call for better and stronger regulations and policies include:

- The introduction of large-scale BESS into TESS;
- The need to climate-proof all investments and physical infrastructures that will be put in place under TREP; and
- The integration of diverse renewable energy technologies into TESS.

(ii) Key regulatory frameworks and policies to be delivered under Component 4 of TREP will include:

- Activities that will develop the capacity for better and more sustainable O&M protocols and wherewithal within relevant Tongan organizations (e.g. TPL) for renewable energy generation assets to be located in the outer islands. This will be achieved through focused O&M training workshops and the development of manuals; and
- Activities focused on the development of local capacities for tariff-setting and for putting in place transparent processes for PPA negotiations with IPP that will encourage the flow of private sector funding into Tonga to finance the needed renewable energy investments. These activities will be accompanied by sound regulations and policies to guide these activities.

(iii) The previously approved PIRIEP (FP036) for the Cook Islands (approved for GCF funding in December 2016) includes a regional technical assistance component that will also help in putting in place the right regulatory framework and policy for the TREP intervention. The relevant subcomponents of this include:

- Sector planning (roadmaps and grid integration studies);

- Power utility management reform and capacity-building;
- Tariff review and reform;
- Review and revision of regulatory and policy frameworks, if necessary; and
- Promotion of the private sector by identifying opportunities for IPPs, providing transaction advice and designing guarantee products.

16. Accordingly, the overall paradigm shift of the proposed framework, given the state of the project proposal (reviewed in para. 16 above), has been assessed as "High".

Scale: High

1.3 Sustainable development potential

17. Some of the wider benefits and priorities of this project that will support the Sustainable Development Goals (SDGs) include:

(a) **Environmental benefits and co-benefits:**

The shift in the generation of electricity from diesel fuel to renewable energies will gradually reduce the use of diesel fuel and its attendant negative environmental impacts. Key SDGs and the direct environmental benefits and co-benefits that will be enhanced by this intervention can be summarized as follows:

(i) Reduction in local air pollution that usually arises from the combustion of diesel fuel, as well as noise pollution;

(ii) Reduction in the use of diesel fuel for electricity generation, which will reduce the propensity for fuel spills, a potential source of land and water body contamination;

(iii) A programme under TREP to replace the existing fragmented solar home systems in some of the islands with clean solar PV mini-grids with centralized battery systems. Old and damaged lead acid batteries from the existing fragmented solar home systems (SHS) will be collected under this programme and properly disposed of. This will eliminate the environmental degradation faced by many communities in the past from the handling and disposal of lead acid batteries; and

(iv) Environmental safeguard policies introduced through TREP, which will facilitate more environmentally sound development in the island;

(b) **Economic co-benefits:**

Key economic co-benefits that will accompany the TREP intervention can be summarized as follows:

(i) Improved access to reliable and clean power will enhance the economic viability of businesses on the island. This effect will be more pronounced in the outer islands, where electricity access is currently very low;

(ii) The project will result in downward pressure on electricity tariffs, especially to businesses on the island who currently face steep and increasing power tariffs caused by the global oil prices;

(iii) The TREP-induced shift to renewable energies will also result in a reduction in petroleum import bills for Tonga, thus reducing funds for other development activities;

(iv) The shift from imported diesel to renewable energies will also improve national energy security as the renewable energy resources will be indigenous to Tonga. This will also help to enhance business development in the country; and

(v) The shift from diesel to renewable energy resources will also encourage the development of entrepreneurial capacities within Tonga, while also enhancing the tourism industry as a result of the improved and clean energy supply.

(c) **Social co-benefits:**

The following are a list of social co-benefits that are expected to be generated by the project intervention:

(i) Improved electricity available to some households in Tonga will lead to more viable income-generating activities;

(ii) Reduced household expenditure on energy that is expected to result from the TREP intervention will free income for other essentials such as education and food;

(iii) Markedly improved electricity access on the outer islands that is expected to result from the TREP intervention will generate social benefits such as:

- Improved education;
- Improved income generation at household levels;
- Reduced household expenditure on kerosene;
- Lowered fire risk from the decreased use of kerosene lighting; and
- Reduced wood fuel consumption.

(iv) Improved electricity supply will result in improved lighting and hence improved community interactions and conflict resolutions.

(d) **Gender-sensitive development impact:**

The anticipated gender co-benefits of this programme will include:

(i) Improved community lighting, which will result in increased safety and hence increased women's participation in social gatherings;

(ii) Improved household access to electricity provides more benefits to women;

(iii) Lower electricity costs also provides more benefits to women, who will have access to more household income to meet other costs;

(iv) Improved lighting leads to increased security and safety for children and women, and this may lead to reduced abuse towards children and women;

(v) According to the information presented in the funding proposal, gender mainstreaming has been built into the TREP in the following ways:

- TREP will make extensive efforts to involve women in project activities. A well-articulated programme has been included in the submission as annex 2F, with a clear action plan on how women will be involved;

- Under the ongoing OIREP, TPL successfully employed 8 trained women (out of 15 workers) at the project site. Four of these women completed the same tasks on Haʻapai under another project funded by the ADB. It is expected that the TREP process will create a long-term employment opportunity for these female workers.

18. Given the discussions presented in paragraph 18, the independent Technical Advisory Panel (TAP) assesses the sustainable development metric of this submission as "High".

1.4 Needs of the recipient *Scale: High*

19. Key needs of Tonga that were covered by this submission are summarized as follows:

(a) **Vulnerability of Tonga and the recipient population:**

(i) The weak economy of Tonga makes it vulnerable to crude oil price fluctuations due to the importation of diesel fuel for the generation of power. Hence it can be stated that Tonga needs this intervention, which will free the country from the need to use its scarce financial resources to import the fossil fuel. TREP will shift the country away from this fossil fuel dependence and to reliance on indigenous energy resources (solar, wind and biomass); and

(ii) Energy access is poor in Tonga and even worse in the outer islands. TREP will enable the incorporation of renewable energy and BESS technologies into the country electricity supply system, which will enhance power access in the country and especially in the outer islands, leading to an improved quality of life.

(b) **Financial, economic, social and institutional needs:**

(i) Tonga is a small island economy and a lower middle-income country, and because of its geographical location, it is isolated with limited human resources. It is highly dependent on imports with very few exports. Like other Pacific island region countries, the economy of Tonga is vulnerable to external shocks as well as natural disasters. The result is that the population is exposed to poverty, which is also exacerbated by poor access to electricity in many of the islands;

(ii) A Tonga Strategic Development Framework II 2015–2025 (TSDF II) was developed by the Government of Tonga to address the poverty, economic and social challenges that the economy of Tonga poses on its people. A key strategy of TSDF II is to increase energy access in the country. Given the fact that a cardinal goal of TREP is to increase access of the people of Tonga to electricity, it will make a direct contribution to the goals of TSDF II;

(iii) TREP will contribute to establishing a climate-resilient energy sector in Tonga, a necessary basis for socioeconomic and climate-resilient development. Increased access to electricity, which will be catalysed by the TREP intervention, will engender economic activities in households and in industry while boosting tourism;

(iv) The financial intervention that is sought from GCF will enable the flow of investment into Tonga's power sector, which has not been the case in the past. Furthermore, the implementation of BESS will pave the way for private

investment of IPPs into renewable energy power generation in the country. This is unlikely to happen in the absence of the TREP intervention; and

(v) The economic situation of Tonga described above means limited access to finance, both public and private. Access to private sector finance for innovative investments is particularly limited, as the perceived risks are generally high. The possibility of financing the type of intervention planned in TREP through public financing is close to zero as it would push the debt ratio of TPL well beyond its debt sustainability levels, hence the need for grant financing for TREP.

(c) **Institutional strengthening needs:**

(i) Although Tonga has benefitted from several projects in recent years to build institutional, governance, management and technical capacity related to renewable energies, the TREP intervention is needed to strengthen existing institutions and policies so that the technologies (strategic to Tonga and countries in the region), including BESS and renewable energy technologies, can be successfully assimilated and managed; and

(ii) TREP will therefore focus specifically on technical and implementation-related capacity-building to allow TPL and MEIDECC to manage the transition to the higher integration of renewable energy, while existing institutions are expected to be strengthened through technical assistance from regional capacity-building.

20. Given the explanations above, the TAP has rated the need for this project by the recipient as "High".

1.5 Country ownership *Scale: High*

(a) **Existence of a national climate strategy and coherence with existing plans and policies:**

- Like in most other Pacific Island States, energy policy and, by extension, climate change policies are driven largely by regional initiatives and actions. A key regional initiative that is relevant to this intervention is the regional Framework for Action on Energy Security in the Pacific (FAESP) 2010–2020. This FAESP was endorsed by Pacific island leaders in 2010;
- Among the threats to achieving energy security in all countries in the region identified by FAESP, key threats relevant to the situation in Tonga include: remoteness and distance from main centres and supply chain pathways; vulnerability of energy infrastructure to natural disasters such as cyclones, earthquakes, flooding and tsunamis; inability to take advantage of economies-of-scale due to small populations and limited industrial activity; and old and poorly maintained energy infrastructure. PIRIEP was a regional initiative set up to address these threats, and the findings became an important pillar for the development of TREP;
- Furthermore, Tonga's various national documents including the TERM, the Second National Communications that was submitted to the United Nations Framework Convention on Climate Change (UNFCCC) as well as the country's NDC (also submitted to the UNFCCC under the Paris

Agreement) all specified the objective of having 50 per cent of electricity generated from renewable energy sources by 2020. This is in line with the driving objective of the TREP; and

- Upon taking office in 2014, the current Government of Tonga announced that access to affordable and reliable sources of energy is crucial to sustainable livelihoods in Tonga. Furthermore, the Government of Tonga has stated that it is committed to making progress towards the Sustainable Development Goals. TREP has been designed to assist the country in reaching all these goals.

(b) **Capacities of the accredited entities and executing entities to undertake this project:**

(i) The accredited entity (AE) for this TREP is the ADB, while the executing entities include the Ministry of Finance and National Planning (MFNP), MEIDECC and TPL. These entities' capacities to deliver results are briefly summarized as follows:

- MFNP will be responsible for the overall implementation of the project on behalf of the Government of Tonga, especially the disbursement of funds. MFNP has served in this capacity for all the bilateral interventions and other past interventions;
- MEIDECC is an arm of the Government of Tonga that, over the past years, has successfully handled similar responsibilities to the one that it will have under TREP. Some capacity-building efforts under TREP will be spent strengthening the capacity of this organization;
- TPL is the country-owned electricity utility that has been responsible for the existing power supply system in terms of planning, the implementation of power infrastructure and its O&M over the years. The company has capacity in place, which will be strengthened under TREP, especially to enable it to handle the expanded use of renewable energy and BESS technologies;
- The ADB is the AE for TREP. The following summarizes the capabilities of the ADB to serve successfully as the AE for TREP:
    - ADB has 67 member countries, 48 of which are from the Asia and Pacific region; it thus has experience working in the region where this intervention will occur;
    - In 2016, ADB loan and grant approvals to developing member countries amounted to USD 17.8 billion, and total co-financing mobilized, with donor support, amounted to USD 13.9 billion, bringing total sovereign operations to USD 31.7 billion in 2016;
    - In 2016, the ADB approved USD 4.4 billion in climate finance, and of, this the energy sector accounted for 59 per cent, or USD 2.6 billion, including approximately USD 31 million in technical assistance;
    - The ADB was the first multilateral development bank to be accredited to the GCF and the first accredited entity to mobilize GCF funding to the Pacific region (Fiji and the Cook Islands);

- The ADB has the largest energy sector portfolio amongst development partners in the Pacific, covering electricity generation, transmission and distribution; and
- The ADB has been operating in Tonga since 1972 and has provided the country with USD 168.5 million in loans, grants and technical assistance; and

(ii) The explanations above demonstrate that the ADB has the experience to support projects such as TREP. With the capacity-building plan that will be used to strengthen the capacities of the implementing agencies, working with the ADB should bring a seamless delivery of successful results under TREP.

(c) **Engagement with the national designated authority (NDA), civil society organizations and other relevant stakeholders during the planning and design of this project and during the implementation period can be summarized as follows:**

(i) Engagement of the NDA and other executing entities:

- The TERM Taskforce has played a key role in the development of TREP and in ensuring its alignment with national priorities and programmes, notably:
  - The Minister of MEIDECC has played a strong role in coordination;
  - MEIDECC and TPL have been strongly engaged by supporting data collection and analysis and mobilizing co-financing from international partners;
  - The GCF NDA, under MEIDECC, has been regularly involved in planning discussions and has closely followed project development; and
  - The "no-objection" letter, which has been issued, is also an indication of strong country ownership of the project.
- This engagement of pertinent country stakeholders demonstrates that TREP enjoys broad support and understanding from national-level agencies and concerned bodies;

(ii) In addition to this engagement, the development and design of TREP was accomplished through a broad national consultation process; and

(iii) At national level, detailed consultations occurred with relevant government departments (MFNP, MEIDECC and TPL), the accredited entity (ADB), and with potential partners (JICA, Government of Australia, Government of China and Government of New Zealand).

21. Given the comprehensive information presented in the funding proposal and summarized in this section, the TAP has concluded that this submission can be ranked as "High" with regard to the country ownership metrics.

1.6 Efficiency and effectiveness *Scale: High*

22. The economic and financial soundness of the project are considered along the following metrics:

(a) ***Cost-effectiveness and efficiency:***

(i) The 100 per cent grant funding for TREP is predicated on the limited ability of Tonga to borrow. This limited ability to borrow is further buttressed by the 2018 decision by the Board of the International Monetary Fund to raise Tonga's risk of external debt distress from moderate to high because of future costs of natural disasters. With this classification, Tonga becomes eligible to receive 100 per cent grants from many development partners;

(ii) Public sector grant financing has been used to-date for financing renewable energy projects in Tonga. The fact remains that such public sector financing is very scarce, and as such grant financing will not crowd out financing needs for other similar interventions. By the same token, the grant financing that will be used in TREP will be targeted at developing an expanded BESS base in TESS, which is not considered suitable for private sector investment, and therefore TREP will also not crowd out private sector financing; and

(iii) Another sound reason for using grant funding for TREP is the fact that the funding is expected to deliver the much-needed BESS, which is expected to pave the way for the flow of private IPP investment into the development of more renewable energy power facilities in the Tongan system beyond 2020.

(b) ***Co-financing, leveraging and mobilized long-term investments:***

(i) The total volume of the facility is expected to be USD 53.20 million. Of this, the GCF contribution is expected to be USD 29.90 million, accounting for around 56.20 per cent of the total financing required to implement TREP;

(ii) The ADB, other donors and local entities (TPL and the Government of Tonga) are expected to provide co-financing of USD 23.30 million. Of this co-financing, the ADB is expected to provide USD 9.20 million in the form of a grant; and

(iii) This is well within the capacity of the ADB, given its track record and the fact that commitments from the other donor (Government of Australia) has been obtained.

(c) ***Application of best practices:***

Some of the applications of best practices incorporated into the project can be summarised as follows:

(i) The project design process has been supported by leading international experts on renewable energy technologies with experience in Tonga and other Pacific countries. This will ensure that international best practices will be utilized in the implementation of the project; and

(ii) A competitive bidding process will be used to ensure that the most robust, hazard-resistant and latest technologies and practices are procured for this project;

(d) Key efficiency and effectiveness indicators:

- Total project financing: USD 53.20 Million
- Requested GCF amount: USD 29.90 Million

- Expected lifetime emission Reductions: 340,395 tCO2eq
- Estimated cost per tCO2eq: USD 156.29 per tCO2eq
- Estimated GCF cost per tCO2eq: USD 87.84 per tCO2eq.

23. Given the discussions above, the TAP has rated the efficiency and effectiveness metrics of this project as “High”.

IV. Overall remarks from the independent TAP

24. Based on the assessment, the TAP recommends that the Board approve this project funding proposal with the following condition:

25. Prior to the execution of the FAA, submission to the Fund by the Accredited Entity of a copy of the Project Administrative Manual, approved by the Accredited Entity, which shall include, to the satisfaction of the GCF Secretariat, the methodology covering GHG emissions reductions brought about by the funded activity.

Independent Technical Advisory Panel's assessment of FP091

Proposal name:	South Tarawa Water Supply Project
Accredited entity:	Asian Development Bank (ADB)
Project/programme size:	Medium

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: High*

1. Kiribati is formed by 33 islands with a total land area of 810 kilometres squared (km^2), spread over 3.5 million km^2 of sea in the Pacific Ocean. South Tarawa, the nation's capital, lies on the Tarawa Atoll and has a land area of 15.72 km^2 and at its highest point is only 3 metres (m) above sea level. The city currently uses three water sources: (1) the Bonriki and Buota lenses; (2) household and community rainwater harvesting (RWH); and (3) household groundwater wells.[1]

2. The Public Utilities Board (PUB), a state-owned enterprise, supplies water from the Bonriki and Buota lenses through a distribution network that includes pumps, treatment facilities, storage facilities, transmission and distribution pipes. The coverage of the water supply system in South Tarawa is estimated at 69 per cent. The distribution network is in very poor condition, with water losses estimated at 67 per cent.[2] The Project Preparatory Technical Assistance (PPTA)[3] document estimates that currently, the population receives an average of only 11 litres per capita per day (l/c/d), considering an extraction of 2,000 m^3/day and 67 per cent losses. If water losses in the distribution network were reduced to 15 per cent, and assuming a daily per capita consumption[4] of 55 litres and a population of 56,000, the current water need would be approximately 3,500 m^3/day.

3. Rainwater is used by 50 per cent of the population of South Tarawa as their main source of drinking water. RWH could be a viable supply option, since the island receives an average annual rainfall of 2,000 millimetres (mm). However, the inter-annual variation is very high, with a lowest record of 400 mm in 1950 and a highest of 4,400 mm in 1993, and the monthly average varies from 0 to 800 mm. Drought events have an average interval of approximately seven years, and an average duration of two years.[5] For these reasons, the proposal recognizes that the potential of RWH is limited to a supplemental water supply.

4. Groundwater from household wells is usually saline due to over-extraction and contaminated by poorly managed domestic wastewater.

5. The reliability and sustainability of the main water sources in South Tarawa are threatened by the possible effects of climate change.

[1] Small-scale private desalination plants and imported water are other less significant sources.
[2] Project Preparation Draft, page 148.
[3] Annex B to the funding proposal, prepared by GHD (a consulting firm).
[4] The proposal considers a consumption of 50 l/c/d plus 5 l/c/d for commercial, institutional and governmental uses.
[5] Annex F1, page 7.

6. Sea level rise could increase the incidence of overtopping. The funding proposal states that an overtopping event with a current return period of 100 years could increase its frequency due to climate change to a return period of 20 years,[6] and could reduce the yield of the water lenses by half for several years.

7. There is not much certainty or consensus on how the duration and intensity of drought events in Kiribati will be affected by climate change. *Climate and Abstraction Impacts in Atoll Environments* (*CAIA)* (2016) modelled the impacts of hypothetical extreme droughts on the available yield from the Bonriki lens and concluded that a six-year drought (twice as long as the one that occurred in 1998–2000) could reduce the yield by 40 per cent for several years.

8. However, the funding proposal recognized that there are no previously recorded incidents of climate events affecting the yield of the lens.[7]

9. Based on the Tarawa Water Master Plan and the Bonriki Inundation Vulnerability Assessment, the Government of Kiribati concluded that the most viable option to be developed as backup for the existing water supply system is the construction of a desalination plant with a capacity of 4,000 m^3/day (expandable to 6,000 m^3/day).

10. The proposed project is composed of the following main activities: (1) construction of a 4,000 m^3/day desalination plant; (2) renovation and expansion of the distribution network; (3) construction of a 2,500 kW photovoltaic power plant; and (4) awareness campaign on climate change, water and health issues. It includes awarding design-build-operate contracts for the desalination plant and the distribution network, which would include operations and maintenance (O&M) for five years and capacity transfer to PUB as a key task in the scope.

Adaptation impact

11. The project would directly benefit the entire population of South Tarawa, which currently accounts for 62,000 people, or approximately 53 per cent of Kiribati's population in 2018, expected to grow to 59 per cent by 2041.

12. The impact of the project may be restrained by the lack of willingness to pay on the part of the population. On the one hand, if the tariffs are set higher than the willingness to pay to achieve financial sustainability, the rate of households connected to the network could result in smaller coverage than expected. Consumers may still choose to use contaminated groundwater over charged piped water. The project expects to tackle this issue through the awareness campaign, which would aim at strengthening trust in the service and provider and creating acceptance and demand for the supply of safe piped water. On the other hand, if tariffs are set too low following a low willingness to pay, the excessive financial burden on the government could render the system financially unsustainable.

13. The complete willingness to pay study will not be finished before the end of 2018. As stated in the PPTA document by GHD,[8] "Presently available data are not sufficient to make predictions of consumer behaviour or the quantity of incremental water consumed after the project is commissioned, especially in regard to the impact of a given water tariff on consumption decisions." The pre-assessment carried out during the community workshops, with an attendance of around 400 people found that the willingness to pay is less than 10 Australian dollars (AUD)household per month.[9]

[6] The funding proposal, page 10, states that this was concluded by the "Bonriki Inundation Vulnerability Assessment", but no reference to those conclusions were found in the versions of the study received under this submission.
[7] Funding proposal, page 11.
[8] Annex B to the funding proposal.
[9] Funding proposal, page 32.

14. Nevertheless, the facts of water being a basic need for the well-being of the population[10] and that currently available water sources are not reliable or sustainable when considering the possible effects of climate change, make a strong argument for the desalination option. In this regard, the Bonriki Inundation Vulnerability Assessment compares desalination against large-scale RWH and concludes that desalination is the most cost-efficient alternative. Household RWH has a similar cost but could be less reliable.

15. If, beyond the project lifespan, the Government allocates sufficient funds to cover the additional needs to adequately operate and maintain the water supply system, keeping the desalination plant operating under good conditions and the distribution network with relatively low water losses, it is expected that project activities could significantly increase the resilience to climate change of the water supply system of South Tarawa, making the population less vulnerable to climate change risks.

16. The WASH awareness programme would comprise water use, climate change, groundwater contamination, hand washing, menstrual hygiene management, house water treatment and sanitation. The design development, including potential behavioural factors, suggested behaviour change techniques and a theory of change is accurately described on the PDD and present a solid rationale.[11] However, the outreach potential of the programme is not clear.

17. Non-revenue water (NRW) is a key issue to be addressed by the proposed project. The current NRW rate is estimated in the funding proposal at 92 per cent (the data to support this unusually high number are not presented), with physical water losses roughly estimated at 67 per cent. The PPTA document describes a sound NRW reduction strategy, including a proposed NRW division structure for PUB, leak detection and repairs, billing aspects and no/low cost measures. The document does not provide NRW percentage targets because of the lack of knowledge regarding the current state of the network.[12]

Mitigation impact

18. The project's mitigation component is related to the offset of carbon dioxide emissions that could be accomplished by the proposed photovoltaic power plant: around 98 per cent of the energy demand of the entire water supply system in 2020 and around 73 per cent of the demand in 2041 would be supplied by the photovoltaic power plant. On the baseline scenario, the distribution network operates on diesel power, and with the project it will be supplied by the photovoltaic power plant. The photovoltaic power plant emission reduction was estimated at 3,900 tonnes of carbon dioxide equivalent (tCO_2eq) for the 2018–2041 period.

19. The current poor quality of the water generates a need for boiling. Families usually boil water three times a day. The supply of safe water, together with the outcomes of the awareness programme, would promote the discontinuation of this practice, avoiding burning an estimated 1.5 million litres of kerosene per year in 2018 and 2.3 million litres in 2041. The emission reduction potential was estimated at 107,000 tCO_2eq for the 2018–2041 period.

20. Considering a project emission for 2018–2041 of almost 22,000 tCO_2eq, the total emission reduction that could be achieved by the project is estimated at almost 90,000 tCO_2eq.

[10] On 28 July 2010, through resolution 64/292, the *United Nations* General Assembly explicitly recognized the human *right* to *water* and sanitation and acknowledged that safe and *clean drinking water* and sanitation are essential to the realization of all human rights.
[11] Annex B - PPTA, page 160.
[12] Annex B - PPTA, page 129.

1.2 Paradigm shift potential *Scale: Medium*

Innovation

21. Desalination is not an innovative system for the region. There are desalination plants under operation in Tuvalu, Nauru, the Marshall Islands, Tonga and Kiribati. The first one was installed in Tuvalu in the 1980s. Desalinated water is the main source of drinking water in Nauru. The largest plants were installed in the 1990s in the Marshall Islands, with a capacity of 680 m^3/day, and in Nauru, with a capacity of 1,100 m^3/day, both working on the excess heat from a power plant. They were both later decommissioned because of repeated malfunction.[13] However, the proposed desalination plant would be the first one of its size in the region, and the combination with the photovoltaic power plant can be considered innovative.

Potential for knowledge and learning

22. Knowledge and lessons learned would be disseminated through several mechanisms, including the Pacific Water and Wastewater Association's annual conference and a regional knowledge sharing event, Pacific-based events such as the 2019 Asian Development Bank (ADB) Annual General Meeting in Fiji or Asia-Pacific events such as the 2018 Asia Pacific Adaptation Network Forum to be held at ADB headquarters, and sharing information with Pacific policymakers through the ADB knowledge memorandum of understanding with the University of the South Pacific. The desalination plant will also include the construction of a visitor education centre to educate plant visitors about desalination, water resources management and their relation to climate change risks.[14]

23. The monitoring, evaluation and reporting methodology would be completed before the first disbursement and would be in line with the ADB Evaluation Policy. The project management unit would be responsible for project monitoring and reporting. The project manager would be responsible for the preparation of biannual reports on progress, which would include the current level for all indicators, the implementation challenges and the financial status, and quarterly and annual workplans. An independent evaluation would be undertaken after project conclusion.

Contribution to the creation of an enabling environment

24. The greatest risk to sustainability beyond project lifespan is the fact that with the proposed hypothetical tariffs, the Government would have to allocate USD 1,600,000 per year to subsidize the O&M of the new water supply system.[15] These tariffs are based on the pre-assessed willingness to pay. The current subsidies from the Government are much lower (the funding proposal shows that in 2016 the Government had to allocate USD 230,000 to cover O&M expenses[16]) and currently, based on the water losses, the network could be assumed to be in very poor condition. However, the funding proposal states that the Government has formally committed through a Cabinet decision to meet the balance of finance needed for the ongoing operation of the new water supply system after project lifespan.

25. The technical sustainability of the project is mainly backed by the design-build-operate contracts for the desalination plant and the distribution network. The chosen firms would be in charge of O&M during the first five years of the project. The contracts will explicitly include activities related to mentoring and capacity transfer to the PUB staff.

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[13] Pacific Islands Applied Geo-Science Commission Water and Sanitation Programme. *Desalination in Pacific Island Countries: A Preliminary Overview*.
[14] Funding proposal, page 27.
[15] Independent Technical Advisory Panel responses including WTP 10.5.2018.
[16] Funding proposal, page 21.

Moreover, activity 2.2 includes the provision of technical assistance to PUB on customer service and billing, human resources, financial sustainability and asset management, and vocational training for technical and administration staff and mentoring and training for managers in PUB.[17]

26. The WASH awareness programme is expected to achieve the long-term behavioural change needed to support the sustainability of the project.

Contribution to the regulatory framework and policies

27. "Walk the Talk", part C of the WASH awareness programme, would contribute to the policy and regulatory framework for water and climate change. This component is focused on strengthening policy, regulations, institutional capacity and leadership. It includes increased enforcement of WASH-related regulations and strengthening the Government of Kiribati's leadership in WASH. The programme would be led by the Ministry of Infrastructure and Sustainable Energy.

Potential for scaling up and replication

28. If the project succeeds in achieving the sustainable operation of the desalination plant, the project has significant potential for replication in other Pacific island countries, as most of them share similar water challenges.

29. The main channel for promoting replication is through the ADB Investment Program and network of partners across the Pacific. ADB is currently developing water supply and/or sanitation investment projects in Fiji, Tonga, Palau, the Marshall Islands, the Federated States of Micronesia, Papua New Guinea, Solomon Islands, Timor-Leste and Vanuatu.

1.3 Sustainable development potential *Scale: Medium to High*

Environmental co-benefits

30. The only environmental co-benefit derived from the implementation of the project consists of the emission reduction that could be achieved by the offset of emissions of the photovoltaic power plant and, most importantly, by the avoidance of boiling water for consumption.

31. Regarding potential negative effects, the PPTA document indicates that the impact of increased water supply in wastewater generation would not be significant because the proposed household water connections comprise a single tap located outside the household. The inconvenience of not having running water inside the house and the cost implied for the use of the new connection would encourage users to use the new source as little as possible. However, the new water supply system is calculated based on an average consumption of 57 l/c/d. Middle-income households (48 per cent of total households (HH)) are expected to consume up to 70 l/c/d. A middle-income family of seven persons (the average), which was previously using not more than 100 litres per day, could start consuming almost 500 litres per day. This shows that the increase in water use could be significant.

32. The three major centres in South Tarawa (Betio, Bairiki and Bikenibeu) are served by a sewerage system with low coverage (13 per cent). Most of the population uses soakaway

[17] Funding proposal, page 18.

pits or latrine pits. Only 35 per cent of South Tarawa's population has access to improved sanitation.[18]

33. Pilot Sanitation Systems is an ongoing initiative supported by the World Bank which intends to include the piloting of low-cost sanitation, with a priority focus on three pilot villages which will soon receive a continuous water supply through a different project. [19] The South Tarawa Sanitation Improvement Sector Project, currently being implemented with the support of ADB, is rehabilitating the trunk sewer mains, the salt water flushing system, the associated pumping infrastructure and the three ocean outfalls. The funding proposal contains no information about the expected increase in improved sanitation as a result of these projects.[20]

Social co-benefits

34. The most significant social co-benefit is the health improvement that would be achieved by the significant increase in safe potable water availability. Water-borne diseases are a major threat because all the main water sources in South Tarawa are contaminated: groundwater from household wells is contaminated by the lack of domestic sanitation infrastructure and water from the current piped system is contaminated because of intermittent no-pressure events which allow groundwater to filter into the network. Water-borne diseases in South Tarawa increased from 12,000 in 2005 to 35,000 in 2016. This situation could be substantially improved if continuous supply is achieved.

Economic co-benefits

35. Economic co-benefits would include: reduction in the use of kerosene, improvements in household income levels and security of livelihoods, avoided costs of medical treatment, avoided costs of lost productivity on the part of patients and caregivers, and the value of avoided loss of statistical lives due to water-borne diseases.

Gender-sensitive development impact

36. Women are usually in charge of collecting water and caring for sick relatives. In this regard, they will be directly benefited by project outcomes. Women may be able to increase their monthly incomes through using time saved in collecting water to pursue income-generating activities.

1.4 Needs of the recipient *Scale: High*

Vulnerability of the country and region

37. Climate change projections that would affect Kiribati's freshwater sources include sea level rise (13 to 33 cm by 2050), increase in average annual rainfall, seasonal rainfall and the number and intensity of extreme precipitation events, and increased frequency of overtopping events (from 100 years to 20 years return period).[21]

38. There is not much certainty or consensus on how the duration and intensity of drought events in Kiribati will be affected by climate change. *Climate and Abstraction Impacts in Atoll Environments (CAIA)* (2016) modelled the impacts of hypothetical extreme droughts on the available yield from the Bonriki lens and concluded that a six-year drought (twice as

[18] Annex B - PPTA, page 149.
[19] Funding proposal, page 20.
[20] Annex B - PPTA, page 149.
[21] Funding proposal, page 10. However, the reference to overtopping events was not found in the submitted documents.

long as the one that occurred in 1998–2000) could reduce the yield by 40 per cent for several years.

39. It can be said that even though the current state of the water supply system in Kiribati is not a result of climate change, but rather of insufficient investment in maintenance during the last decades, the possibility of increased overtopping due to climate change induced sea level rise and the assumed possibility of more intense droughts could have a significant negative impact on the yield of the freshwater lenses of the island.

40. However, it should be noted that the funding proposal recognizes that there are no previously recorded incidents of climate events affecting the yield of the Bonriki lens, meaning that the freshwater lenses have not yet been impacted by climate change. [22]

Vulnerable groups

41. The most vulnerable group in South Tarawa consists of the low-income households, which represent 50 per cent of the total population. The proposed "rising block" tariff structure includes a "lifeline block" of 7.5 m^3/month, up to which water will be provided for free. The limit of the lifeline block was defined based on an average household size of seven persons and a consumption of 35 l/c/d. This presents the risk, recognized in the proposal, of poor households with more than seven members exceeding the limit and having to pay the tariff intended for middle-income households. The problem would be solved by the provision of communal taps. Poor households that reach the lifeline limit could collect the extra water from those taps for free.

Economic and social development level

42. Kiribati is classified as a small island developing State, a fragile state and a least developed country. In 2016, it ranked 169th of countries in the world in terms of gross domestic product per capita, and 137th on the Human Development Index. Due to its geographical remoteness and vulnerability to climate change, Kiribati faces significant development challenges.[23]

43. The latest Household and Income Expenditure Survey (2006) estimated that 66 per cent of the country's population was either poor or borderline (highly vulnerable to falling into poverty). Unemployment in South Tarawa is very high at 63 per cent, with women making up 60 per cent of this group.[24]

Absence of alternative source of financing

44. As stated in the funding proposal, Kiribati is at high risk of debt distress due to its limited economic base and vulnerability to external shocks. ADB extends 100 per cent grants to Kiribati. The International Monetary Fund carried out a debt sustainability analysis in 2017 and concluded that public investments for climate change adaptation will remain dependent on development partners' financial support.[25]

45. In accordance with Kiribati's limited financial capacity, the proposed project is to be 97 per cent grant financed. ADB and the World Bank would finance 26 per cent and 22 per cent, respectively, of the project. GCF would finance 50 per cent of the project.

The need for strengthening institutions and implementation capacity

[22] Funding proposal, page 11.
[23] Funding proposal, page 7.
[24] Funding proposal, page 30.
[25] Funding proposal, page 5.

46. Although the institutional weaknesses of PUB are not explicitly described in the proposal, the need for institutional strengthening is directly addressed through activities 2.2.3 and 2.2.4.

1.5 Country ownership *Scale: High*

Alignment with priorities in the country's national climate strategy

47. The project is aligned with the national adaption programme of action (NAPA) (2007), the intended nationally determined contribution (INDC) (2015), the Kiribati Joint Implementation Plan for Climate Change and Disaster Risk Management 2014–2023, the Kiribati Development Plan 2016–2019, the National Water Resources Policy (2008) and the National Energy Policy 2009. The NAPA recognizes the need to take measures to adapt to the potential increase in overtopping events. Through the INDC Kiribati committed to reduce emissions by 13.7 per cent by 2025 and 12.8 per cent by 2030, without international assistance, and by more than 60 per cent by 2030 with international assistance. The other above-mentioned national policies recognize and promote the development of safe and sustainable water sources and renewable energy sources.[26]

Capacity of accredited or executing entities to deliver

48. ADB has extensive experience in this kind of project. Through the Asian Development Fund, ADB has approved for Kiribati 14 loans and grants for a total amount of USD 66.5 million, and 41 technical assistance projects worth USD 19.6 million. ADB is currently working with the Government, with the Ministry of Finance and Economic Development (MFED) as the executing entity, on the South Tarawa Sanitation Improvement Sector Project and Kiribati Road Rehabilitation Project.

49. The capacity of MFED to act as executing entity was evaluated in the PPTA document, in the financial management assessment.[27] Adequate measures to mitigate the identified control weaknesses are also included in the funding proposal.[28]

Engagement with civil society organizations and other relevant stakeholders

50. The consultation process involved a series of meetings and interviews with relevant stakeholders, including the Ministry of Infrastructure and Sustainable Energy, PUB, the Office of the President, the Ministry of Environment, Lands and Agricultural Development, the Ministry of Women, Youth and Social Affairs, the Ministry of Health and Medical Services, the Ministry of Education, the Ministry of Internal Affairs, airport improvement consultants, international and national non-governmental organizations, Kiribati Adaptation Program staff and specialists, the Australian Department of Foreign Affairs and Trade, the New Zealand Ministry of Foreign Affairs and Trade and the United Nations Children's Fund.

51. The engagement with the benefited population included a total of 20 community workshops carried out across 13 villages during July/August 2017. Over 400 people attended the workshops, with an average age of 42, 58 per cent of them women and most representing low or no income households. The aim was to inform the community about the key aspects of the proposed project, the alternatives being considered, opportunities and issues and

[26] Funding proposal, page 31.
[27] Annex B - PPTA, page 198.
[28] Funding proposal, section F.4.

stakeholders' roles and responsibilities, and allow feedback about concerns and questions. A pre-assessment of willingness to pay was carried out during the workshops.

1.6 Efficiency and effectiveness *Scale: Medium*

Cost-effectiveness and efficiency

52. The selection of desalinated seawater as a source for the water supply system is based on the results of the Bonriki Inundation Vulnerability Assessment,[29] which compared desalination with household-level and large-scale RWH and concluded that large-scale RWH has higher unit costs than desalination and household RWH presents similar costs.

53. Using a 20-year analysis, the unit cost for large-scale and household RWH and desalination are estimated at AUD 13, AUD 8 and AUD 5 per m^3, respectively.[30] However, when water losses in the network are considered, the study shows that losses of 25 per cent would take the unit cost to almost AUD 7/m^3. Also, the unit cost for desalination of AUD 5/m^3 does not include the costs of distribution. So, if water losses remain higher than 25 per cent, household RWH would be more cost-efficient than desalination. [31] Other published O&M costs vary between AUD 3/m^3 and AUD 7/m^3.[32] The PPTA document estimated O&M costs at AUD 2.6/m^3, which, adding the depreciation of assets, could reach AUD 4.5/m^3.

54. However, as previously stated, RWH options may not reliable as the main safe water supply because of the effect of droughts and the potential impact of climate change on drought patterns.

55. The proposed water supply project has an overall per capita cost of USD 943, which is relatively high.[33]

Financial viability

56. The project consists of the provision of a public service, and for this reason should not be decided upon on the basis of a financial analysis.

57. Independently from the required level of tariff that allows zero cash loss for PUB, the tariffs are intended to be set according to the willingness and ability to pay of the population. All households will be encouraged to connect to the system, even if they cannot pay for a tariff that covers full service cost.

58. The economic analysis takes into account the capital and operational expenditures of the proposed investments and economic co-benefits as described in paragraph 35 above. This analysis gives an estimated economic internal rate of return of 22.1 per cent. The economic net present value of the project calculated at a 9 per cent discount rate is USD 44.1 million.

59. Willingness to pay is not certain. The pre-assessment made during the 20 community workshops in 2017 found that people are willing to pay less than AUD 10/month/HH. However, since a more representative willingness to pay study has not yet been undertaken, the proponent has no means to ensure that the population will agree to pay the proposed tariffs. As the O&M costs for the proposed treatment system are higher than the ones being incurred by the current treatment system, and the Government has a very limited budget for

[29] Carried out in 2015 by Anna Rios Wilks for the Secretariat of the Pacific Community. See "BIVA 1960 KL Preliminary Economic Analysis Report FINAL.pdf".
[30] Including depreciation of assets.
[31] Bonriki Inundation Vulnerability Assessment, page 27.
[32] As footnote 13 above.
[33] Taking into account the full cost of the project.

water and sanitation, if the selected tariff structure generates a bigger need for government subsidies, the risk of not having sufficient resources to adequately operate and maintain the system is high.

60. To ensure long-term sustainability, the Government committed through a Cabinet decision to meet the balance of finance needed for the O&M of the new water supply system. Concerning future governments that could discontinue the subsidies, the proposal explains that the State-Owned Enterprises Act (2012) includes provisions to enable PUB to apply for subsidies from the Government, and makes reference to the Community Service Obligation of PUB, which force it to supply the service even if it is not commercially viable.

Amount of co-financing

61. ADB and the World Bank would finance 26 per cent and 22 per cent, respectively, of the project. GCF would finance 50 per cent of the project. The Government would provide an in-kind contribution estimated at USD 1.5 million, which would include: (i) the involvement of PUB in pipe-laying works in selected zones; (ii) office space for the project design advance and project implementation assistance consultants; (iii) land space for the installation of the desalination plant and solar photovoltaic system; and (iv) staff from in full/PUB assigned to the project management unit. The Government/GCF investment ratio is very low (1.5/29) but can be justified by Kiribati's severe financial constraints.

Application of best practices

62. The project would provide 100 per cent metered connections. Proposed meters are based on a base-level manually read type.[34] Given that the assumed water consumption for the project is considerably low for piped water (between 35 and 120 l/c/d depending on household income) and the treatment capacity is designed based on these figures, the independent Technical Advisory Panel (TAP) recommends the use of prepaid water meters.

63. The project builds on the experience of a desalination project recently implemented by ADB in the Marshall Islands, where saltwater wells were used instead of open intakes or beach wells. Raw water from saltwater wells has been naturally filtered and presents very low suspended solids, which drastically reduces the need for pre-treatment. Also, in these wells seawater is mixed with rainwater, therefore total dissolved solids are expected to be 10 to 20 per cent lower than salt water from a nearby lagoon. These facts help to reduce the total cost of the treatment.

64. Another best practice is the incorporation of performance-based contracts, which would be part of the design-build-operate contracts of the desalination plant and the distribution network. These contracts will regulate the outsourced O&M for five years following construction works and will include performance targets such as reduced NRW, continuity of supply, energy efficiency and water quality compliance for the distribution network, and quantity produced per day, plant available capacity, quality of water produced, energy consumption and timing of membrane replacement, for the desalination plant.

65. Reduction of NRW would include the use of District Metering Areas (DMAs). Most communities in South Tarawa are supplied by an isolated header tank fed from the transmission main. Therefore, DMAs already exist informally. The DMAs would be formalized under the project through the full metering of each zone at the bulk supply and connections levels.

[34] Annex B - PPTA, page 178.

II. Overall remarks from the independent TAP

66. The current lack of a drinking water system in this island State has not been caused mainly by climate change. Rather, lack of funding for adequate infrastructure and operation & maintenance (O&M) stands out as the main reason for the current situation. Nevertheless, saline intrusion and drought conditions, driven by climate change, will have a considerable impact on fresh water availability in the future. Therefore, measures need to be taken to adapt to this condition.

67. Non-revenue water (NRW), that is, physical water losses, apparent losses and unauthorized water consumption, is currently extremely high at 92 per cent, with physical water losses at 67 per cent.

68. The project proponents indicated during the interview stage with iTAP and the Secretariat that in addition to the proposed desalination facility, the budget includes the required actions to reduce NRW. To put it in layperson terms, high-quality water from the desalination facility will not be largely lost in the transportation and distribution system (physical losses) and in the commercial system (billing and collection). Reducing NRW is an important adaptation strategy for Kiribati.

69. All these aspects have been clarified in the latest version of the funding proposal.

70. In addition to this, the funding proposal adequately addresses sanitation and hygiene in an awareness programme with the involvement of local civil society organizations. Such programmes are key to making effective the health benefits related to an adequate drinking water supply.

71. Based on this assessment, iTAP recommends that this project be approved on condition that, prior to the first disbursement, the accredited entity delivers to the Secretariat a study that measures the community's willingness to pay for water services and that confirms that the communities are willing to pay at least the amounts set out in tables 6 and 7 of the Funding Proposal.

Independent Technical Advisory Panel's assessment of FP092

Proposal name:	Programme for integrated development and adaptation to climate change in the Niger basin (PIDACC/NB)
Accredited entity:	African Development Bank (ADB)
Project/programme size:	Medium

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: High*

1. The funding proposal, titled "Programme of integrated development and adaptation to climate change in the Niger basin" (PIDACC/NB), seeks to implement a programme of integrated development and adaptation to climate change in the Niger basin. This is a medium-sized programme offering various cross-cutting activities that are mainly focused on climate change related adaptation but which also have mitigation impacts. The programme covers nine African riparian countries (Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Guinea, Mali, Niger and Nigeria) from the Niger basin, and it covers several result areas of GCF: forest and land use; health and well-being, and food and water security; and ecosystem and ecosystem services.

2. The programme is based on the Niger Basin Climate Resilience Investment Plan (CRIP),[1] which was developed by the above-mentioned nine countries and presented at the twenty-first Conference of the Parties (COP 21) to the United Nations Framework Convention on Climate Change. CRIP aims to enhance climate resilience of participant countries located in West and Central Africa by increasing coordination to strengthen the climate change resilience of regional and national ecosystems as well as the adaptation capacities of populations through investments in reliable information systems, strengthened institutions, and sustainable infrastructure.

3. Along with CRIP, there are other strategic documents drawn up by the Niger Basin Authority (NBA) that contribute to PIDACC/NB, such as the Silting Control Programme Master Plan, the Sustainable Development Action Plan (SDAP) and the 2016-2024 Operational Plan (OP).

4. The funding proposal considers 17 outcomes of the programme grouped in three components: (1) strengthening of ecosystems and natural resources resilience; (2) increase of population resilience; and (3) programme coordination and management. Ecosystems considered in Component 1 include: water, land, biodiversity, including forests, and wetlands.

5. **Component 1,** with 41 per cent of the total cost of the funding proposal, has two subcomponents and eight outcomes: sustainable land management, sustainable forests management; sustainable agroforestry; protection of natural habitats; strengthened climate and

[1] Following the ministerial round table on the future of the Niger River, held on 19 April 2015 in Washington, D.C. during the Spring Meetings of the World Bank and the International Monetary Fund, the Niger countries and the Niger Basin Authority agreed to launch an initiative directed at building a coherent ensemble of actions and investments to strengthen resilience to climate change in the Niger River Basin, with the objective of mobilizing resources for climate-related development.

weather information services, including last mile early warning systems; the development of a regional pollution prevention plan; the set-up of a payment mechanism for environmental services and a regional adaptation fund for climate change (FRACC); and strengthened capacity for integrated water resources management implementation at national and regional (i.e. NBA) levels.

6. **Component 2,** with 49 per cent of the total cost of the funding proposal, has two subcomponents and seven outcomes: development of a master plan for river navigability; an increase in population resilience; strengthening of climate resilient hydro-agricultural infrastructure; establishment of water points for cattle and transhumance pathways; improved navigation for river sections; construction of infrastructure for improved productivity in fishery; preparation of community-based climate adaptation action plans (for 65 community catchments); and an increase in local economic development because of the upgraded, community-based livelihood infrastructure.

7. **Component 3,** with 10 per cent of the total cost of the funding proposal, aims to strengthen the coordination mechanism and has two outcomes: dissemination of good adaptation practices and climate information; and strengthened monitoring and evaluation (M&E) by the NBA Environment Observatory.[2]

8. The total cost of the programme is USD 209.903 million. GCF will contribute 32 per cent, of which the highest share (40 per cent) GCF has allocated for the implementation of Component 1, which aims to increase the climate change resilience of ecosystems. Approximately 23 per cent of the GCF contribution is allocated for Component 2, which is mainly focused on development of infrastructure for strengthening the adaptive capacities of the local population. Approximately 15 per cent of the total GCF contribution will be directed towards implementation of Component 3, which cover 50 per cent of the total cost of this component. A further 14.6 per cent of GCF funding will be provided in the form of a subordinated loan to the participant countries, the biggest part of which (95.5 per cent) will be invested by the national governments in infrastructural projects for increasing adaptive capacity. A more detailed distribution of the GCF grant and loan money by countries and by activities is provided in annex III to the funding proposal.

9. The programme has the USD 78.09 million in co-financing from the African Development Bank from which 54 per cent is in the form of a grant. Other donors include the European Union, the Global Environmental Facility and the Forestry Investment Fund, which are providing USD 40.06 million in the form of a grant. The remaining 11 per cent of the cost will be covered through in-kind contributions from countries and final beneficiaries.

10. The impact of the adaptation component of the programme is expected to be high based mainly on needs of the participant countries. Some preliminary statistics that were assessed regarding the impact of the programme are provided below:

(a) By reducing carbon dioxide (C02) emissions by 1.4 million tonnes annually, the programme promises to reduce CO2 emissions by 7 million tonnes over its 5-year lifespan; this is not high, but it is an important additional impact;

2 The NBA monitors the conditions of the Basin (done, in practice, through the NBA's Observatory of the Environment), provides services to key stakeholders (including flow forecasts) and a neutral analysis of planned water abstractions, and it mobilizes high-level expertise for relevant studies and analyses. The observatory will handle the monitoring and evaluation function which includes data collection and all required tasks to track programme indicators, in collaboration with national agencies.

(b) Direct beneficiaries of adaptation measures are estimated at 4 million people (3.6 per cent of the total population3 of the Niger basin), with an additional 10 million (9 per cent) estimated indirect beneficiaries;

(c) The expected increase in the generation and use of climate information in decision-making is 50 per cent; and

(d) Enhanced climate resilient landscapes are estimated at: 40,000 ha for forestry; 26,000 ha for agroforestry; 10,000 ha of dunes stabilized; 110,000 ha of degraded land restored; mechanical and biological management of 45,000 m3 of ravines undertaken; and 62,500 households (500,000 people) will benefit from last-mile early warning systems for climate extremes such as floods and droughts.

11. The most important impact is expected from strengthening decision support tools through integration of climate risk management in decision-making processes, strengthening of hydrological forecasting based on rainfall-runoff models driven by projections of future precipitation, and application of the soil and water assessment tool to determine the impact of landscape measures. The enhanced tools will enable decision-makers to effectively evaluate and implement climate adaptation measures.

1.2 Paradigm shift potential *Scale: High*

12. The paradigm shift realized by PIDACC/NB has several dimensions:

(a) The programme plans to introduce a new decision-making tool (the soil and water assessment tool) and integrate the climate change component into planning. In particular, future projections of precipitation and drought will be integrated into the planning of Niger basin sustainable management activities at the regional and national levels. Since 2012, MIKE Basin, later updated to MIKE HYDRO, were applied by NBA experts to manage water allocation and flood projections in the short term;

(b) PIDACC/NB will create an enabling environment by establishing a financing mechanism (environment funds) for promoting payment mechanisms for environmental services for biodiversity conservation, wildlife corridors and watershed protection in the Niger basin that were not used before. PIDACC/NB also plans to set up a FRACC, which will be fed by the royalties paid by heavy users of the water. Establishment of financial mechanisms for climate change adaptation is transformational for these countries, which are among the 25 poorest countries facing severe impacts from climate variability;

(c) PIDACC/NB will facilitate the maximum involvement of local communities in planning and implementing climate change adaptation and mitigation measures; and

(d) Coordinated management of the river basin natural resources started much earlier than this funding proposal, but PIDACC/NB contributes to strengthening the coordination and management capacities of regional and national authorities, integrating new decision-making tools.

1.3 Sustainable development potential *Scale: High*

13. PIDACC/NB is fully oriented on sustainable development of the Niger basin. It could be said that the programme contributes to most of Sustainable Development Goals (SDG). The

3 Total population of the river Niger basin is around 110 million people. Average annual increase of population is 3 per cent and expected to rise to more than 180 million by 2025.

funding proposal's concept, which is based on the initiatives of the river Niger countries, is expected to contribute most highly to "Partnerships for the Goals" (SDG 17), which sstates that "A successful sustainable development agenda requires partnerships between governments, the private sector and civil society. These inclusive partnerships built upon principles and values, a shared vision, and shared goals that place people and the planet at the centre, are needed at the global, regional, national and local level." Within this process of partnership, the climate action (SDG 13) undertaken for implementation of SDG 14 (Life Below Water) and SDG 15 (Life on Land) is the target area of the funding proposal. As a result of the actions implemented in the listed SDG areas, it is expected that the goals of poverty reduction (SDG 1) and decent work and economic growth (SDG 8) will also benefit significantly.

14. PIDACC/NB will contribute to the implementation of objectives from the three Rio Conventions, which were ratified by all NBA countries, including the Convention on Climate Change, the Convention to Combat Desertification and the Convention on Biological Diversity.

15. In addition, in response to a question from the independent Technical Advisory Panel (TAP), the accredited entity confirmed that no activity will be approved that involves any of the following: (i) locations in nature reserves; (ii) any significant loss of primary forest, mangroves or sensitive wetlands; (iii) any permanent negative effects on known rare or endangered species; (iv) any significant impacts on air quality and water quality; and (v) involuntary relocation of people. These conditions are already reflected in the project selection criteria.

1.4 Needs of the recipient *Scale: High*

16. Six (Benin, Burkina Faso, Chad, Guinea, Mali, Niger[4]) of the nine riparian countries involved in the programme are classified as least developed countries by the United Nations, and all nine countries are among the top 25 poorest countries in the world as of 2018.[5] Opportunities for sustainable development in the Niger basin are great. According to the CRIP document, over 70 per cent of the population lives in areas where food security depends on unreliable rainfall and highly variable inter-annual and intra-annual river flows.

17. In the considered region, along with the climate change impact, there are several other dimensions defining the needs of the countries participating in the programme, such as: demographic growth in the Niger basin increasing pressure on natural resources and the environment; poverty and low adaptive capacity to ongoing changes, in particular changes caused by global warming, increasing the climate change vulnerability of the poor population as well as of the infrastructure and ecosystems in the basin; political conflicts and conflicts over the use of shared natural resources; and gender inequality and weak institutions.

18. Climate variability has long been a challenge for development in the Niger basin. Climate change will compound extreme events and create further obstacles to the region's achievement of the SDGs related to water management, food security, environmental sustainability and health, among others.

19. Scientific studies suggest three areas of particular concern for the region over the next few decades: an overall rise in temperature, provoking increased evapotranspiration; a rise in sea-level in the maritime delta; and increased variability of rainfall and extreme weather events, resulting in floods and droughts.

20. Most of these needs are addressed by PIDACC/NB.

4 Available at <https://en.wikipedia.org/wiki/Least_Developed_Countries#Africa>.
5 Available at <https://naijaquest.com/poorest-countries-in-the-world/>.

1.5 Country ownership *Scale: High*

21. PIDACC/NB is fully based on the development and climate change programmes and strategies of the countries, including their nationally determined contributions, national adaptation plans of action, climate change-related strategies, national communications, SDGs, and national strategies for disaster risk reduction.

22. Country ownership is integrated in the Niger basin sustainable management programmes that were the basis for PIDACC/NB. These programmes are:

(a) **SDAP and its Implementation Plan (2008- 2027)**. SDAP defines and guides the development process in the Niger basin. It comprises 350 actions and USD 7.2 billion in funding. An estimated 89.4 per cent of the investments included in the OP is devoted to strengthening the resilience of the Niger basin population;

(b) **Silt Control in the mid-Niger River Basin**. The project results are: adoption of a Silting Control Master Plan and Investment Programme; institutional strengthening of the NBA Executive Secretariat and member countries, and watershed restoration and anti-silting plans for approximately 38,088 ha of land;

(c) **Climate adaptation initiatives in the Niger basin**. The COP 21 initiatives relating to the Niger basin are numerous, particularly in terms of adaptation to climate change. The regional institutions (Economic Community of West African States, Economic Community of Central African States, and Permanent Inter-State Committee against Drought in the Sahel CILSS, etc.) each have initiatives for adaptation to climate change specific to the water resources sector. These strategic documents define priority areas for intervention at the national and regional level to enhance resilience to climate change; and

(d) CRIP and river Niger adaptation were the main sources of the programme and were developed through intensive consultations among the nine participant countries. From a climate adaptation point of view, CRIP (2016-2024), which was presented at COP 21, is the primary guiding document with respect to climate adaptation within the Niger basin. The programme was developed so that the measures selected are compatible and complementary to the above initiatives to ensure they are coherent at the national and regional level. CRIP (2015) is a strategic planning document that comprises 246 climate change adaptation actions for strengthening resilience to climate change throughout the Niger basin.

23. National workshops for the validation of general feasibility studies for the national components of PIDACC/NB were organized in October 2016. Subsequently, a regional workshop was held from 7-9 November 2016 in Conakry, Guinea, which validated the technical and environmental and social safeguards studies of PIDACC/NB at the regional level.

24. The funding proposal has a concessional loan component for national governments, which demonstrates the high ownership and readiness of national governments to consider climate change adaptation measures as one of the priorities for the loan request.

1.6 Efficiency and effectiveness *Scale: High*

25. Efficiency of the programme is expected to be high because it is jointly initiated by the participant countries and NBA, and activities considered within the programme are based on

different regional, Niger basin, and national climate change adaptation and general resiliance-incresing strategic programmes (which were considered in the sections above).

26. The implementation structure of the programme is quite strong. It is coordinated by the NBA, which was established in 1980 as the successor to the Niger River Commission. The NBA is the regional river basin organization mandated to promote cooperation among its nine member countries to develop and manage the basin's resources. The mandate of the NBA is to "promote cooperation among the member countries and ensure an integrated development of the Niger Basin in all the fields of energy, water resources, agriculture, livestock, fishing and fish-fanning, forestry and forestry exploitation, transport and communications and industry". The programme will use existing implementation arrangements to ensure national government endorsement and involvement, engagement with relevant line ministries, and appropriate technical oversight. The NBA member countries decided in February 2002 to lead a shared vision process for the sustainable development of the Niger basin. The shared vision is an expression of the countries' commitment to promote a framework for enhancing cooperation and sharing benefits deriving from the Niger basin's resources.

27. In addition, inclusiveness at the local level is planned to be high. Specific adaptation measures will be identified and projects for implemention will be developed by local communities (i.e. the final beneficaries[6]) with the technical support provided for the project through national coordinated entities established by the countries responsible for the programme ministries and supported by the project.

28. The GCF-financed activities under PIDACC/NB are expected to contribute directly to adaptation by increasing resilience to climate shocks in poor and extremely poor households. The improved resilience will potentially benefit 4 million people directly and 10 million indirectly. The programme plans to implenet 65 community level climate change adaptation plans developed through broad participation of final beneficiaries. Plans will be developed taking into consideration future climate change patterns downscaled as much as possible to local levels.

29. The programme has a good understanding of those climate change impacts in the Niger basin that have already been revealed and a well-assessed climate change rationale for each activity/measure planned (for the climate change rationale of the activities/measures see annex IV of the funding proposal), which should ensure the success of the adaptation measures.

30. The ratio of leveraged co-financing is estimated at 2:1. A total of USD 52.3 is planned to be spent by programme per direct beneficiary. The GCF contribution will be USD 17 per direct beneficiary, including loans.

31. The independent TAP believes that despite the broad variety of actions spread among different countries, the well organized regional implementation structure and long-term experience of the accredited entity guarantees effective implementation of the programme. In addition, the parallel implementation of these different types of actions for different but interlinked ecosystems and infrastractures should have a higher demonstrated impact than separate projects for countries or for ecosystems.

II. Overall remarks from the independent Technical Advisory Panel

32. The independent TAP recommends the funding proposal for approval by the Board.

[6] The community groups (producers, fishermen, breeders, women's groups, agricultural groups, resource management groups, youth groups, etc.) are the final beneficiaries of the projects.

Independent Technical Advisory Panel's assessment of FP093

Proposal name:	Yeleen Rural Electrification Project in Burkina Faso
Accredited entity:	African Development Bank
Project/programme size:	Medium

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: Medium/High*

1. Burkina Faso is a landlocked Sub-Saharan country with a population of approximately 18.6 million as of 2016. It is a low income country with a per capita gross-domestic product of USD 624 (as of 2014) which represents only 61 per cent of the income needed to support standard of living of an average inhabitant of a developing country in Sub-Saharan Africa. The country's poverty rate improved recently but it was as high as at 40.1 per cent in 2014. It is estimated that nine out of every 10 poor people live in rural areas in Burkina Faso.

2. The country's economy relies heavily on its agriculture sector, which provides livelihood to more than 80 per cent of the population. The sector has been impacted by a steady decline in the volume and quality of rainfall, rising temperatures, floods and droughts caused by climate change.

3. The country has only 18 per cent access to electricity at the national level and only 3 per cent in rural areas. This is considered very low compared with the African average of 40 per cent. Since it is fired mostly by imported diesel from neighbouring countries, the thermal power generation capacity of 292 MW represents 81.5 per cent of the total installed capacity of the country. As a result, the country has one of the highest electricity tariffs in West Africa, which ranges from USD 0.23 to 0.27/ kWh in urban areas and an industrial tariff of USD 0.4 / kWh.

4. The Government of Burkina Faso policy promotes a uniform power tariff for both urban and rural areas, under which subsidies for diesel are available for rural electrical cooperatives (COOPELs). Despite the Government efforts, however, the policy has not proven effective in terms of rural energy access given technical and financial constraints the COOPELs face.

5. The proposed mitigation project consists of 3 Components. Component 1 is funded by Sustainable Energy Fund for Africa (SEFA), a multi-donor trust fund administered by the African Development Bank (AE), with a grant. This Component will review the current legal, regulatory and institutional framework for a rural electrification model with an aim to recommend effective measures to promote a sustainable rural energy access financed by private sector investors in Burkina Faso. Such measures include template concession contracts and electricity tariff methodology to be applied to the rural electrification by the private sector.

6. Component 2 will promote installation of 100 mini-grids powered by an aggregate solar photovoltaic power generation capacity of around 11.4 MWp to achieve 50,000 connections in two regions. Under this Component, solar power mini-grid developers are invited to submit a competitive proposal to offer the best combination of tariff and service levels to household, community and productive users. Successful developers will be contracted for mini-grid operation for the concession contract. A project development grant will be offered to the

successful developer/operator to carry out detailed surveys, and to design its investment and operation for the mini grids. The developer will be further eligible to a concessional loan from the Government to be funded with GCF sovereign loan proceeds, and a grant for each connection for tier 3 access levels and above successfully commissioned in line with the concept of results-based financing (RBF). The Component 2 will be implemented in line with the outcome of the Component 1.

7. The funding requirement for Component 2 is projected to be EUR 49.4 million in total. The GCF is requested to provide a grant for RBF, and a sovereign loan to the Government of Burkina Faso. The latter will be on-lent by the Government to the successful developer under concessional terms to enhance the viability of its investment with the capped electricity tariff. The balance will be provided by the European Union, the African Development Fund, successful developer's equity contribution and project debt directly mobilized from the AE under commercial terms with no sovereign guarantee.

8. The AE will provide two technical assistances (TAs). One for mini-grid developer to carry out surveys and design its investment, and another one for Agence Burkinabé d 'Electrification Rurale (ABER) to undertake project monitoring and quality assurance framework.

9. Component 3 will implement the provision of productive use equipment to foster economic activities in the regions where mini-grids are to operate. Micro-finance institutions and local banks will extend loans to finance productive use equipment to be purchased by micro-, and small-sized enterprises (MSEs) connected to the mini-grids. The beneficiaries of the productive use loans will repay the loans through their electricity bill. The African Guarantee Fund (AGF), a company owned by European agencies and AE, will extend guarantees to micro-finance institutions and local banks cover the default risk of MSEs. The GCF is requested to counter guarantee the AGF guarantee obligation.

10. The proposed project aims to install 100 mini-grids of around 11.4 MWp capacity to achieve 50,000 connections in 100 rural localities. It is expected to deliver an annual reduction in carbon dioxide (CO2) emissions of 11,500 tons in the first year for 50,000 households and up to 21,800 tons per year for 104,000 households per year by year 25. The renewable energy generation of Burkina Faso will increase from 9 per cent to 12 per cent once the proposed project is commissioned.

11. The AE calculation of the impact potential assumes an annual population growth of 3.1 per cent over the project concession period and subsequent capital investment to cope with the demand increase. The AE estimates an average annual emission reduction of 15,500 tCO2, which means the total lifetime emissions avoided over 25 years will reach 387,500 tCO2.

12. The proposed project will provide electricity access to 335,000 people with an estimated annual consumption of 15 GWh. This corresponds to an annual per capita consumption of 44 KWh that corresponds to 72 per cent of the national average of 60 KWh for 2015. The number of MSEs supported by productive use is estimated at 3,300. Over 2.6 KWh would be consumed by MSEs representing 17 per cent of the total electricity produced.

13. The project will also create between 200 and 700 permanent jobs in the mini-grid sector including jobs created under Component 3. Additional temporary jobs will be created in subsequent expansion of solar photovoltaic facilities and connections.

14. The impact potential of the proposed project is notable. However the expected impact is based on the assumption that the mini grid operator is able to continuously mobilize financial resources for expansion to meet the demand increases resulting from population growth, which is estimated at 3.1 per cent annually. Therefore uncertainty remains regarding the impact

potential. Accordingly, the Independent Technical Advisory Panel (TAP) views the impact potential of the proposed project as "Medium/High".

1.2 Paradigm shift potential *Scale: High*

Potential for scaling up and replication

15. In general, mini-grid operations in Sub-Saharan Africa have been relying on Government subsidies. Burkina Faso is not an exception. The proposed project aims to promote private sector investment in mini-grids by mitigating regulatory risks and providing financial incentives (Government concessional loan and RBF). It is expected that private sector mini-grid operator will operate financially self-sustainable with no subsequent Government financial assistance, such as subsidies.

16. Cooperative models in Burkina Faso are not functioning as intended due to lack of technical capacity and insufficient Government subsidies. The capacity of ABER also needs to be strengthened to build the enabling framework and design successful tenders with private sector participation that is acceptable to local communities. The monitoring and evaluating capacity of ABER requires enhancement as well. TAs available under Component 1 and 2 of the proposed project can fulfil such needs.

17. The operational and financial risk of private sector investment is further mitigated by creating stable demand to electricity, and raising consumers' ability to pay for the electricity distributed by the mini-grids under Component 3. As a result, sustainability of mini-grid operation can be enhanced.

18. A development model proposed by the project is holistic and can be scaled up and replicated in Burkina Faso and other countries to promote sustainable solar power mini-grids in rural areas with limited or no grid connection.

Potential for knowledge and learning

19. Component 1 and 2 include TAs for review of existing regulatory framework and implementation and monitoring of the proposed project. The AE confirms that strong interest exists among stakeholders to access information and lessons learned of the proposed project given large potential of mini-grids operation in the region. Findings and results of the TAs will be disseminated among Government offices and key stakeholders in Burkina Faso, and more broadly in the region taking advantage of the AE's broad presence and operation promoting renewable energy and green mini-grids.

20. The AE is the focal point for all mini-grid activities in Africa. The AE operates Green Mini-Grids Help Desk, through which technical assistance to mini-grid developers and policy makers is provided. It is currently supporting more than 60 green mini-grid developers in 30 countries as well as to several energy ministries.

Contribution to regulatory framework and potential for the creation of enabling environment

21. The TA proposed under Component 1 includes the review of the existing legal, regulatory, and institutional framework for a rural electrification model with an aim to recommend effective measures to promote a sustainable rural energy access financed by private sector investors in Burkina Faso. The mini-grid project under Component 2 will be implemented based on findings and recommendations of Component 1. Accordingly the proposed project contributes to the development of regulatory framework and enabling

environment suitable for sustainable rural electrification with private sector involvement in Burkina Faso.

22. The proposed project is innovative and holistic in promoting private sector participation in solar power mini-grids in rural areas in Burkina Faso. Application of RBF for power connection is innovative and believed to be effective to realize the expected results by aligning the interest of public and private sectors. The Independent TAP considers the paradigm shift potential of the proposed project to be "High".

1.3 Sustainable development potential *Scale: Medium/High*

Environmental co-benefits

23. The proposed project promotes the construction and operation of 100 mini-grids powered by renewable energy in rural areas. With the project, the use of diesel for power generation and traditional biomass is expected to be suppressed. The unsafe disposal or elimination of batteries that have been disposed of and which have been causing soil and water pollution can be constrained according to assessment produced by the AE.

Economic co-benefits

24. The proposed project will enhance access to electricity in rural areas where only 3 per cent of the population currently has access. It is expected that energy expenses of average households for lighting and mobile charging would be lowered by 40 per cent through this project.

25. With the proposed project, the country will be able to promote private sector participation for rural electrification and renewable energy generation with EUR 19.1 million financing without Government sovereign guarantee.

26. It is estimated that 200-700 jobs will be created as a result of the implementation and operation of 100 mini-grids and from productive use of electricity in agriculture, agro processing and light manufacturing.

Social co-benefits

27. With the proposed project, access to electricity will be enhanced contributing to health and safety of households, especially among women and children by reducing smoke and soot from kerosene lamps and candles, as well as fire hazard from naked flames.

Gender-sensitive development impact

28. The mini-grid project under Component 2 strives to provide women and girls with equal opportunities of access to energy, education, health care, decent work, and representation in decision-making processes. The proposed measures are to provide equal training and employment opportunities for women when TA is provided to ABER. Activities targeting women's participation and training as part of the TA will make sure that the program is gender-sensitive and the benefits are shared among men and women.

29. The Independent TAP regards the sustainable development potential as "Medium/High".

1.4 Needs of the recipient *Scale: High*

30. The economy of Burkina Faso is heavily dependent on the rural sector consisting of the water-agriculture-forest-land use subsectors where more than 80 per cent of the population gains livelihood. Nine out of every 10 poor people live in rural areas in Burkina Faso. The vulnerability of the country has been intensified as the region is affected by steady decline in the

volume and quality of rainfall, rising temperatures, floods, droughts and violent winds caused by climate change.

31. The proposed project will contribute to the greenhouse gas (GHG) reduction objectives set in the Intended Nationally Determined Contribution (INDC). As per its INDC, the Government estimates GHG emissions will grow significantly by a factor of almost 1.6 from 21,916 $GgCO_2eq$ through 2030.

32. The proposed project aims to develop and implement renewable energy powered mini-grids with the participation of the private sector, which is self-sustainable with no financial assistance from the Government. This will help ease budgetary pressure on the Government for electricity subsidies while developing sustainable livelihoods in rural areas where nine out every 10 poor people live.

33. There have been no mini-grid projects in the Sub- Saharan Africa financed solely with commercial debts. Commercial banks in Burkina Faso offer loans of a maximum tenor of 10 years with approximately 10 % interest rate. Lack of competitive-priced loans with longer tenor is regarded as bottleneck for private sector investors to engage in rural electrification projects without Government subsidies. As a result, the majority of debt to mini-grid projects has been extended on concessional terms or in the form of convertible notes from early stage investors.

34. The GCF financial assistance for the mini-grid operator under Component 2 will be made in a form of RBP. Commercial banks do not structure and extend assistance in RBP. Hence, GCF assistance can be justified.

35. The GCF concessional loan to the country is provided as a sovereign loan. The AE confirms that the concessionality will be passed on to the mini-grid developers to implement the project. Since it is passed on to the developer, and ultimately to consumers in rural areas in a form of affordable power tariff, the concessionality is considered acceptable for GCF.

36. The independent TAP the views needs of the recipient as “High”.

1.5 Country ownership *Scale: High*

Existence of a national climate strategy and coherence with existing plans and policies

37. In INDC announced by the Government in 2015, mitigation and adaptation themes are integrated as the water-agriculture-forestry- land use sector, the country’s economic engine, is large in GHG emission but also a major in sequestration. Therefore, adaptation is expected to enhance mitigation in Burkina Faso.

38. The Government’s commitments indicated in INDC include an annual GHG emission reduction of 7,808 Gg, or 6 per cent reduction compared to BaU, for ongoing investments of USD 1.25 billion. It also includes a conditional scenario of expected GHG emissions of 13,766 Gg, or 11.6 per cent, for investments of USD 756 million. To achieve the targets, the Government strategies include, among others, promotion of renewable energy at least by eliminating fossil fuel subsidies and, at best, by subsidizing investments in renewable energy.

39. The National Action Program for Adaptation to climate change and variability (NAPA) was adopted in 2007. The Government develops a National Adaptation Plan (NAP) focusing on sectors vulnerable to climate change mostly linked to the rural economy in order to initiate a comprehensive medium- and long-term approach (2025 to 2050) to adaptation to climate change. The Nationally Appropriate Mitigation Actions (NAMA) in 2008 focused on the National Rural Sector Program (NRSP), which consists of sectorial programs of the departments of agriculture, livestock raising, water, the environment and quality of life.

40. The proposed project, which aims to address energy access in rural areas, is aligned to the priorities identified in the Government's climate strategies and plans.

Capacity of accredited entities and executing entities to deliver

41. Through sovereign and non-sovereign operations, the AE has an extensive experience in financing renewable energy projects in Sub-Saharan Africa. Between 2011 and 2017, the AE invested around UA[1] 1.25 billion from its own resources in support of renewable energy in addition to UA 390 million in co-financing.

42. The AE's investment excluding early stage project preparation support is assumed to have realized 3GW of renewable generation capacity: 1GW from hydro, 900 MW from wind, 860 MW from solar, 175 MW from geothermal and 5 MW from biomass. The AE's climate finance portfolio of over 300 projects is chiefly consisted of mitigation projects while the number of adaptation projects is expected to increase.

43. The AE, through Green Mini-Grids Market Development Programme (GMG MDP), provides technical support to more than 60 GMG developers in 30 countries, as well as to several Government energy ministries. The GMG MDP country assessments for GMG opportunities are already concluded for Burkina Faso, Cameroon, the Democratic Republic of the Congo, Ethiopia, Madagascar, Mali, Mozambique, Nigeria and, Uganda The AE is currently Chair of the Mini-Grids Partnership a body of sector stakeholders that coordinates concepts and interventions related to mini-grids development in the region.

44. The portfolio of the AE in Burkina Faso as of April 2017 comprises 16 active projects totalling UA 335.35 million. The sector distribution of the active portfolio is: transport (46 per cent), agriculture (21 water and sanitation (10 per cent), private sector (12 per cent), energy (8 per cent) and the multisector (3 per cent).

45. The AE proposes ABER to be an executing entity (EE) for Component 1 and 2, and the African Guarantee Fund (AGF) for Component 3.

46. The Electrification Development Fund (FDE) was established by the Government in 2003 to manage the expansion of rural electrification in Burkina Faso. In 2017, the Government decided to transform FDE into the ABER in order to improve operational capacity while keeping its current responsibilities. ABER operates under the authority of the Ministry of Energy and Mines.

47. The ABER possesses experience in working with developmental financial institutions. Out of the 222 communities electrified from 2003 to 2016 in Burkina Faso, 134 were financed by donors such as World Bank, the Danish International Development Agency Danida), the European Union and, Agence Française de Development (AFD).. ABER has been the executing agency for all rural electrification projects.

48. The ABER, as EE, will be in charge of monitoring the technical execution of the project with its key involvement in the tender preparation. The AE has maintained satisfactory relationship with ABER under the Sustainable Energy Fund for Africa (SEFA) grant framework since 2015.

49. AGF was established in 2012 and is a non-bank financial institution owned by Danida), the Spanish Agency for International Development Co-operation (AECID), the French Development Agency (AFD), the Nordic Development Fund (NDF) and the AE.

50. The AGF supports financial institutions in promoting lending to small- and medium-scaled enterprises by providing partial guarantees and capacity building. As of December 2016, AGF operations were present in 38 countries in Africa with partnerships with 73 financial

[1] Unit of Account, equivalent to the IMF's Special Drawing Right.

institutions and 117 subsidiaries issuing over $450 million guarantees. A total of 4,000 SMEs have been supported by AGF. The AGF is currently revising its product features to include unconditional and irrevocable guarantees to be offered under Component 3 of the proposed project.

Engagement with national designated authorities, civil society organizations and other relevant stakeholders

51. The proposed project is part of the Yeleen programme being promoted by the AE in partnership with AFD. It was launched by the President of Burkina Faso in November 2017. The programme contains both on-grid Component, and off-grid Component, which includes the proposed project. In project development and structuring, the AE has undertaken consultations with key stakeholders including Ministry of Energy, Ministry of Environment Green Economy and Climate Change (NDA), ABER, Federation of electricity cooperatives of Burkina Faso, Association Impulsion – owner and operator of a mini-grid in Barsalagho, Representatives of the communities of the regions where mini-grids are to operate. A non-objection letter issued by the National Designated Authority (NDA) is attached to the funding proposal.

52. The AE and EEs possess sufficient experience and resources to implement the proposed project. It is also confirmed that the proposed project has been developed and structured in consultation with Government agencies and communities. Accordingly, the independent TAP assesses country ownership of the proposed project as “High”.

1.6 Efficiency and effectiveness *Scale: Medium/High*

Cost-effectiveness and efficiency regarding financial and non-financial aspects

53. The AE estimates that the proposed project will deliver annual emissions reduction of 11,500 tCO2 to 21,800 tCO2 by connecting 50,000 households in year 1 and 104,000 households by year 25. The total lifetime emissions avoided is estimated at of 390,000 tCO2. GCF is requested to provide EUR 24.3 million of the total project financing of EUR 53.1 million. Accordingly, the estimated project cost per tCO2eq is EUR135 per tCO2eq. With respect to GCF cost, it is estimated to be at EUR 62/tCO2eq, which can be considered efficient.

Amount of co-financing

54. The GCF is requested to provide 45.7 per cent of the project cost. Co-financing includes European Union and African Development Fund (ADF) for RBF and technical assistance to be offered to mini-grid operator. It also includes equity investment to be made by mini-grid operator and project debt to be mobilized from the AE’s non-sovereign operation. Expected co-financing ratio is 1:1.2 for GCF funding.

Programme/project financial viability and other financial indicators

55. The proposed project is considered financially viable. The AE considers that projected IRR represents an acceptable return in the context of a long-term concession. Accordingly, the project is able to attract private sector investment, and the mini-grid operation can be sustainable during the term of concession.

56. GCF financial assistance is critical to maintain the mini-grid tariff at a level that the Government stipulates and community can afford to pay according to the AE projection. Otherwise, the tariff has to be raised and resulted in project being financially unviable and technically suboptimal.

Industry best practices

57. In order to address the demand supply gap for electricity to be generated from solar in a day, the proposed project promotes, under Component 3, productive use of electricity during daytime by MSEs, like grain mills, workshops, cold storage, and even irrigation. With additional and stable demand created by productive uses of electricity, the mini-grid operator will be able to increase operational and financial efficiency by selling larger amount of electricity during daytime, when demand to electricity is significantly lower than night time.

58. However, the mini-grid operator has to manage power consumption in the evening, as cost of electricity is high, as it has to rely on batteries, the most expensive apparatus of the system. Therefore, efficient load management during night time is required for the mini-grid operator to reduce initial capital investment and depreciation cost during operation.

59. The AE aims to implement measures to enhance the energy efficiency of equipment to be funded under Component 3 following the latest practises proven to be effective. Such practices include introduction of minimum energy performance standards for productive equipment, and latest light-emitting diode lighting technologies.

60. Although it has been implemented in a few nations in Africa, application of productive use of electricity remains new and not yet established. The proposed project aims to promote further a model of productive use of electricity, which can be referred and effectively followed when solar power mini-grids are considered or planned.

61. The expected emission reductions are based on the assumption that the mini grid operator is able to mobilize continuously financial resources for expansion to cope with the demand increase. Given the tenor of the concession, uncertainty remains. Therefore, the Independent TAP regards efficiency and effectiveness of the proposed project as "Medium/High".

II. Overall remarks from the independent Technical Advisory Panel

62. The independent TAP recommends the Board to consider the proposed project as presented.

63. The development model proposed by the project is holistic and can be scaled up and replicated in Burkina Faso and other regions where solar power mini-grid is an option for rural electrification. The project's impact potential may be notable although it remains uncertain. Application of RBF for power connection is innovative and can be effective to promote private sector participation especially in rural areas. The AE and EEs possess sufficient experience and resources to implement the proposed project. The concessionality of GCF assistance is justified in the absence of alternate commercial financing, and since the structure is developed in such a way that the concessionality is passed on to mini grid operator and ultimately to households in rural areas where 9 out of every 10 poor people live.

64. The proposed project is subject to GCF safeguard requirements. Financial assistance to be provided by micro-finance institutions or local banks to MSEs under Component 3 will be subject to a preliminary environmental and social risk screening process although it is likely to be considered as low-level intermediation taking into account the low environmental and social risks that may be associated with the supply and use of productive equipment. The Secretariat confirms that due diligence through environmental and social screening will nonetheless be conducted for Component 3 activities.

Independent Technical Advisory Panel's assessment of FP094

Proposal name:	Ensuring climate resilient water supplies in the Comoros Islands
Accredited entity:	United Nations Development Programme (UNDP)
Project/programme size:	Medium

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: High*

Adaptation impact

1. The project aims to improve the climate resilience of the drinking water supply system in Comoros so that it can withstand the projected effects of climate change, which involve more intense droughts and floods.

2. Comoros has experienced the effects of climate change as a significant impact on rainfall variability in the last decade, which included the worst drought and flood to date. The General Circulation Model predictions confirm a further worsening of both drought duration and storm intensity and frequency.[1] The expected reduction of dry season rainfall would cause lower water availability and increased salinization of groundwater. The expected increase in frequency and intensity of storm floods would cause greater damage to the water provision infrastructure and would affect raw water quality. Climate change effects are expected to increase during the current century.

3. The project will directly benefit almost 370,000 people in Comoros and will cover the urban and peri-urban towns of each island capital (Moroni, Mutsamudu and Fomboni) and 100 rural villages.[2] Through creating an enabling environment for a sustainable climate resilient water sector, national water resources monitoring and climate risk forecasting, the project will indirectly benefit the entire population of the country (approximately 800,000). The estimation of beneficiaries is based on the population census of the targeted areas.

4. Output 1 supports the integration of climate change adaptation into water sector governance frameworks, regulations and supply management operations by guiding the reforms on the decentralization of water management that are currently taking place under the revised Water Code (2015) and by strengthening technical and managerial capacities of national, regional and local water stakeholders. Capacity-building and assistance activities include the development of climate change risk reduction and awareness-raising programmes for national and state agencies; provision of trainings on best practices and gender-sensitive techniques to national, regional and local water stakeholders; strengthening managerial capacity of water agencies to undertake climate risk reduction assessments and

[1] Funding proposal, page 21.
[2] The funding proposal mentions 450,000 people, but that is referred to the year 2043, taking into account population growth.

develop and deliver awareness campaigns and training programmes to Water Management Committees and users; assistance in reviewing the current water tariff reform process to ensure that prices reflect actual production, storage and treatment costs, and that billing rates are socially sensitive; and, development of planning guidance on source protection and water quality standards in view of climate change, operating procedures for periods of drought and floods, and safety plans.

5. The project support for tariff reform, the development of a water sector climate change risk reduction awareness-raising programme, the planning guidance on source protection and water quality standards, and the preparation of recommendations and legal guidance on the integration of climate change adaptation into governance frameworks, regulations and operations, has the potential to positively strengthen the institutional capacity of the water sector agencies.

6. Output 2 aims at improving inter-sectoral coordination and providing capacity-building in watershed adaptation approaches. Project activities would support the creation of Integrated Water Resources Management committees that would be in charge of developing plans for watershed management and restoration activities including zoning of source water areas and delineation of buffer zones, and Ecosystem-based Adaptation (EbA) activities, such as re-vegetation in riparian zones and reforestation of river basins, and improving farming practices and other land-use practices which de-stabilize soils.

7. Activity 2.2, related to the implementation of EbA measures, is briefly described, lacking data on implementation areas and means. As per table 1 of the funding proposal, only USD 190,000 would be allocated for the implementation of these measures.[3] This represents 0,3 per cent of total project budget. In response to comments from the independent Technical Advisory Panel (TAP), the proponent explained that the funds would not be used to finance the implementation cost of the EbA activities but rather to mobilize watershed stakeholders to alter their land-use practices to improve the resilience of local water supplies.[4] Given the lack of an adequate description of previously identified EbA measures and coverage, the impact potential of this activity cannot be properly assessed.

8. The project would also contribute to strengthening the hydro-meteorological information system in Comoros through the installation of 10 hydrological (surface water) gauging stations in the islands of Anjouan and Moheli, the installation of 30 groundwater piezometers on Grande Comore and 13 across Anjouan and Moheli, and the provision of training for technicians on the operation and management of monitoring systems, including capturing, processing, storing and analysing data, and the distribution and sharing of knowledge products and climate information.

9. Key staff in government departments and local authorities would be trained in interpreting hydro-meteorological information and products and generate weather forecasts to support sector specific decision-making. An early warning system would be developed to provide a flood risk warning system for each island. These activities would contribute to strengthen the awareness of climate threats and risk reduction processes and reduce the exposure of the population to climate risks.

10. Output 3 involves water infrastructure upgrades, related to a range of groundwater and surface water-fed water supply schemes, and rain-fed and surface water-fed irrigation supply schemes.

[3] Funding proposal, page 9.
[4] UNDP Comoros _Responses to independent TAP Review 1 _300818.docx

11. More specifically, the project includes the construction of additional boreholes, climate-proofing water infrastructure, setting up treatment systems for water with higher turbidity and bacteria loadings, and expanding agricultural water storage mechanisms.

12. The reason given for not considering the alternative of roof top rain water harvesting as a source of potable water is the insufficient roof top surface (in spite of the fact that the average household tank size is 47 m^3 and could theoretically meet the demand of 8 people on 35 litres per day for at least 150 days).[5] The feasibility study shows the results of the water balance calculations undertaken to assess rainwater harvesting potential.

13. The feasibility study concludes that it is not possible to increase rooftop surface because it would involve rebuilding the houses themselves, therefore rainwater harvesting for domestic use is not considered in the proposal. In fact, rainwater harvesting is not seen as a climate resilient source because of the possible increased duration of droughts as projected by climate change models.

14. Infrastructure upgrades are not intended to increase water supply during normal climatic conditions, but only to secure water provision during climatic extremes that would be exacerbated by climate change.

15. Activity 3.2 would cost USD 31 million, which represents 50 per cent of total project budget,[6] and 74 per cent of the GCF grant. This activity consists of infrastructure upgrades to increase climate change resilience of the water supply system and includes: detailed pre-project studies for the installation of water catchments, reservoir, irrigation systems, treatment units, mini-basins, communal water troughs and impluviums, the installation of flow meters, and the construction of: 31 reservoirs (of 500 m^3 each), 11 water catchments, 174 mini-basins, 109 communal drinking troughs, 179 micro-basins, 35 km of irrigation systems and impluviums in 4 crater areas, 17 water treatment units, and communal potable water supply systems across villages of the three islands.

1.2 Paradigm shift potential *Scale: Medium to High*

Innovation

16. The main innovative aspects of the project reside in its institutional strengthening elements, mainly the development of water committees trained to undertake Integrated Water Resource Management, and the support to enhance coordination and transversal integration of climate change adaptation approaches into the existing framework of institutional reforms on decentralizing water management.

17. The implementation of EbA measures could be considered innovative, but the impact potential of this activity cannot be properly assessed.

Potential for knowledge and learning

18. The funding proposal states that lessons learned would be disseminated through existing information sharing networks and forums, and that there would be continuous information exchange between this project and other similar projects in the country, region and globally.[7]

[5] Feasibility study, page 28.
[6] USD 35 million from the GCF grant (84 per cent of the grant).
[7] Funding proposal, page 106.

19. Arrangements for monitoring, reporting and evaluation include an annual project report, an independent mid-term review, a terminal evaluation, and a final report. The project would provide adequate mechanisms for local communities to participate in data collection.

20. The Ministry of Energy, Agriculture, Fisheries, Environment, Country Planning and Urbanism (executing entity) will provide the UNDP country office with periodic financial statements and with an annual audit of the financial statements relating to the status of GCF funds.[8]

Contribution to the creation of an enabling environment

21. The project focuses on creating an enabling environment for water supply management through supporting the mainstreaming of climate change risks and adaptation knowledge into the water sector management, mainly by integrating climate change into the new Water Code.

22. If adequately implemented, the managerial and technical training programmes will support long-term sustainability of project outcomes.

23. The operation and maintenance costs of the upgraded water infrastructure will be covered by the government of Comoros for the next 25 years, as stated in the proposal and letters of co-financing.[9] The tariff structure would be reformed as part of the present project and, as per the project hypothesis, from year seven, new established tariffs would allow the total recovery of operation and maintenance costs. Considering that Comoros is one of the poorest countries in the world, this co-financing approach is considered to be acceptable from a financial sustainability standpoint.[10]

Contribution to the regulatory framework and policies

24. The main contribution to the regulatory framework and policies resides in the assistance the project would provide for the integration of climate change adaptation into the new Water Code, across water resources, watershed and water supply infrastructure management at the national, inland and community management scales.

Scalability and replicability

25. The target zones were intentionally selected to cover the three islands and include a range of groundwater- and surface water-fed potable water supply schemes and rain-fed and surface water-fed irrigation supply schemes, to ensure maximum relevance across the country and maximize the likelihood of post-project replication in each island. Training activities at national and state level agencies and activities aimed at creating an enabling environment would also support replicability and scalability of project activities in areas not covered by the present proposal. Lessons learned would also be relevant to other water sector adaptation projects in Pacific, Atlantic and Caribbean Small Island Developing States.

1.3 Sustainable development potential *Scale: Medium*

Environmental co-benefits

26. The establishment of a water resource monitoring network and upgrading of the existing monitoring infrastructure for the collection of the required hydro-meteorological

[8] Funding proposal, page 40.
[9] Funding proposal, page 52.
[10] Comoros gross national income per capita is USD 840 and the annual GDP growth dropped from 3.5 per cent in 2013 to 1 per cent in 2015. The poverty level (<USD 1.25/person/day) is as high as 42 per cent, reaching an estimated 80 per cent for the rural population.

data (activity 2.4) and the capacity building of the meteorological services (activity 2.5), would allow a detailed understanding of the recharge and discharge dynamics of the groundwater reservoirs at the watershed level. This knowledge would help to reduce groundwater salinity as a result of improved management of water sources.

27. Other environmental co-benefits reside in the EbA measures. Even though potential EbA measures are mentioned but not described in the proposal, it can be said that, in general, re-vegetation of riparian zones, reforestation of river basins, and improvement of farming practices and other land-use practices will have positive impacts on water quality, soil erosion, siltation of riverbeds, biodiversity and groundwater recharge. Nevertheless, the impact potential of this activity cannot be properly assessed due to lack of data.

Social co-benefits

28. The most important social co-benefits reside in the health improvements that would arise from enhanced water quality and quantity during extreme weather events.

29. Forecasting of storm events that could cause flash floods and early warnings to the population will enhance the safety of the population by allowing timely evacuation of lower ground.

Economic co-benefits

30. Project activities, if adequately implemented, will reduce: (1) damage to all sectors from flood water due to increased capacity in forecasting flood events; (2) damage and repair costs of water infrastructure as a result of enhanced protection against flood water; and (3) losses associated with disruption to business/trade/manufacturing operations through the provision of a more regular water supply during droughts and floods.

31. Improved health of the population will result in more productive incoming earning activities and would reduce expenses of the public health system on water-borne diseases.

32. The increased water storage for irrigation using impluviums and the new stream water intakes will increase water availability during the dry season, thereby resulting in higher cash crop productivity.

33. Infrastructure works, including impluvium rehabilitation, water supply construction upgrades and watershed improvements (EbA) would require construction workers, field workers, suppliers and importers of materials, thus creating employment opportunities in the country.

Gender sensitive development

34. In Comoros, women and girls are traditionally in charge of collecting water, and for this reason, they would be those most benefited by the improved availability of water sources during the dry season.

1.4 Needs of the recipient *Scale: High*

Vulnerability of the country and vulnerable groups

35. Comoros is one of the poorest countries in the world. The gross national income per capita is USD 840 and the annual GDP growth dropped from 3.5 per cent in 2013 to 1 per cent in 2015. The poverty level (<USD 1.25/person/day) is as high as 42 per cent, reaching an estimated 80 per cent for the rural population. The country suffers a chronic economic deficit, and is highly indebted. The agriculture sector in Comoros represents 34 per cent of the total GDP. Unemployment among the population is 14 per cent, reaching 50 per cent among those

aged 15–24. Approximately 75 per cent of the country's population are small-scale farmers who are dependent on rain-fed water resources for subsistence agriculture.

36. The country is highly vulnerable to droughts and increasing frequency and intensity of storm floods and, due to the economic context, has a very limit adaptive capacity. The climate vulnerability is associated with having very small watersheds and aquifers with very limited natural storage, which respond rapidly to changes in rainfall.

37. Evidence suggests that Comoros is already feeling the effects of climate change: (i) data from the existing rain gauges show a mean annual reduction of precipitation on all the islands of 5 per cent per year; (ii) the four driest years in the last 60 were 1999, 2003, 2007 and 2013; and (iii) the number of permanent rivers on Anjouan is reported to have declined from 45 in 1950 to 12 today.[11]

38. Data provided on the proposal indicates that Comoros is experiencing stronger droughts. Climate change projections include increased frequency and intensity of storm events. Droughts and storms impact the availability and quality of water resources. On top of the climate change impact, the country's water supply system will also suffer from low availability and poor water quality during droughts and storms occurring independently of the effects of climate change.

39. The current condition of the water supply system in Comoros is such that less than 30 per cent of the country's population receives treated potable water through a household connexion. Water treatment includes only chlorination. The rest of the population of Comoros uses free, untreated water from various sources: 26 per cent collects rainwater through cisterns, 13 per cent uses running water from neighbouring houses, 24 per cent communal fountains and the remaining 7 per cent use public rainwater cisterns, shallow wells and river intakes.[12] Leakage amounts are unknown because of low metering capacity, but are estimated at 50 per cent.[13] The average water consumption in areas with no household connexion is 35 litres per day per person.

40. The proposal states that the upgrade of water treatment systems, as included in the project, is required to overcome the decrease in raw water quality as a result of more frequent storms due to climate change.[14] However, the majority of water destined for domestic use in the Comoros is not treated, and when it is treated, the treatment includes only minimal chlorination.[15] Water-borne diseases are increasingly common: typhoid fever and diarrhoea are the leading sicknesses for children aged between 3 and 5 years. This shows that the most important issue is the lack of efficient water treatment and not the effects of climate change.

41. The project includes the installation of 300 bulk flow meters. The project provides capacity-building to ensure the use of flow meter data for leakage assessment and integration of leakage reduction into climate resilient operation and maintenance planning and for appropriate climate resilient tariff setting.

42. The project does not include the installation of micro metering. All new potable water systems would be connected to communal tanks.

[11] Funding proposal, page 14.
[12] Feasibility study, page 14.
[13] Since most of the proposed are in areas without a formal water distribution network, or in very small distribution systems in rural communities, traditional approaches to reducing non-revenue water may not be applicable to this project.
[14] Feasibility study, page 64.
[15] Feasibility study, page 14.

43. The project targets the most vulnerable groups: the selection of the 15 target zones, comprising 103 villages, has been based on their vulnerability to climate change, their hydrogeological and hydraulic potential for water storage and capture, and their limited donor support for water supply. The selection criteria are based on the village vulnerability assessments undertaken as part of the CRCCA[16] and ACCE[17] projects as well as the National Adaptation Plan of Action.

Absence of alternative sources of financing

44. As for International Monetary Fund projections, the budget of Comoros will continue to be in deficit at least until 2020 (settling at 12 per cent in 2018–2020). The economic slowdown in 2015/16 and related decrease in tax revenues accentuated deficits. In this situation, Comoros relies on external sources of funds to support its domestic growth and development.

Need for strengthening institutions and implementation capacity

45. The funding proposal identifies and addresses three barriers to increasing climate change resilience of the water sector, related to strengthening institutions and implementation capacity: inadequate stakeholder coordination and collaboration; limited knowledge and data to identify climate risks and develop adaptation responses; and, limited technical capacity to assess and reduce climate risks.

1.5 Country ownership *Scale: High*

Alignment with national climate strategy

46. Climate change issues addressed by the project activities are included in the National Adaptation Plan of Action of 2006 as priority adaptation actions. Drought is recognized as the most important climate change impact.

47. The proposed project is also in line with the Initial and Second National Communications to the UNFCCC and the Accelerated Growth and Sustainable Development Strategy (2015 – 2019), and would support the decentralization process and creation of Integrated Water Resource Management committees, and the tariff reform, included in the new Water Code.

Capacity of accredited entities and executing entities to deliver

48. The executing entity is the Ministry of Energy, Agriculture, Fisheries, Environment, Country Planning and Urbanism. Specifically, this Ministry managed the recent ACCE project and all the French Development Agency water projects and works in collaboration with all government institutions at the federal, island and community levels. The Water and Electricity Enterprise of Comoros (MA-MWE) and the National Agency for Civil Aviation and Meteorology will be co-executing entities, in charge respectively of the activities 2.4, 2.5, 3.1, 3.2 and 3.3.

49. The accredited entity is the United Nations Development Programme (UNDP), which has experience in promoting sustainable development in Comoros and is presently supporting three (3) adaptation projects: the Integrated Water Resources and Wastewater Management Project in the Atlantic and Indian Ocean small island developing States; the

[16] CRCCA: Enhancing adaptive capacity for increased resilience to climate change in the agriculture sector in the Union of the Comoros (UNDP, Least Developed Countries Fund).
[17] ACCE: Adapting water resource management in Comoros to increase capacities to cope with climate change (Global Environment Facility, UNDP)

project for enhancing adaptive capacity for increased resilience to climate change in the agriculture sector in the Union of the Comoros; and the project for strengthening Comoros' resilience to disaster risk linked to climate change and variability.

Engagement with civil society organizations and other relevant stakeholders

50. The design phase of the project involved a series of consultation meetings, undertaken from July 2016 between UNDP, government stakeholders and the consultant design team. Consultations included a review of the Concept Note design, discussions on the roles of different water-related agencies and a series of workshops on the selection of the target zones with the participation of more than 30 agency representatives.

51. Consultations were also held with communities that are totally or partially responsible for water provision. Fourteen Memoranda of Understanding were signed with these communities securing their agreement and commitment to the project. This documents included the type of intervention, land access and involvement in future training and scheme management.

52. Evidence of tariff affordability and willingness-to-pay is limited to a very small portion of the urban population of Grande Comore. The willingness-to-pay of the population of the rest of Grande Comore and the other islands, would be assessed as part of the project.[18]

1.6 Efficiency and effectiveness *Scale: High*

Cost-effectiveness and efficiency

53. Budget allocation for infrastructure upgrades (output 3) were not correctly described in the original funding proposal. The original proposal lacked a clear description of the infrastructure works and their individual costs. Upon request by the independent TAP, the accredited entity submitted a table that described costs for different interventions in a satisfactory manner.

54. For financial calculations, two tariff scenarios were proposed: (i) tariffs are charged from year 7 at the current price paid in Moroni (USD 0.53/m^3); and (ii) tariffs commence in year 7 at two-thirds of the current price in Moroni and increase 20 per cent every 5 years after that. Scenario 2 is considered the most likely. In the case *without concessionality,*[19] where full infrastructure costs, capital expenditure (CAPEX) replacement and operation and maintenance costs for 25 years are accounted for, the internal rate of return is 8.7 per cent. The financial analysis only includes the costs of activity 2.4 and of all the activities of output 3, which together account for USD 51.5 million in CAPEX, USD 1.1 million in replacement CAPEX and USD 10.9 million in operation and maintenance for 25 years.[20]

Amount of co-financing

55. The GCF grant would cover 69 per cent of total project costs. Co-financing from the government of Comoros would include USD 11.4 million in CAPEX, USD 1.1 million in replacement CAPEX and USD 10.9 million in operation and maintenance over a 25-year period – a total funding contribution to the hard components of the project of USD 23.4 million. If only the 8 years of project lifespan are considered, the government of Comoros would be providing USD 14.6 million.

[18] Funding proposal, page 69.
[19] As opposed to "with concessionality", where infrastructure costs only consider the investment of the government of Comoros.
[20] Annex III b – Financial Analysis.

56. The Arab Fund for Economic and Social Development and the China Geo-Engineering Corporation would provide additional grant and in-kind co-financing for the amounts of USD 293,363 and USD 1.9 million, respectively, also for CAPEX funding.

Best practices

57. Best practices involved in the project reside in the combination of water supply side and water demand side improvements,[21] capacity-building in water resources management, technical training in climate change adaptation and hydro-meteorology, watershed adaptation measures, and the creation of an enabling environment in the water sector through the integration of climate change risk reduction into the new Water Code.

58. Best practices adopted on the infrastructure upgrades include:

(a) Installation of water tanks in water supply networks to enable water storage for 1 to 3 days. In case of groundwater systems, this would allow the pumps to work at a minimum uniform rate, therefore reducing risk of saline intrusion. In surface water systems, it would allow intakes to be closed for a day or two during episodes of excessive turbidity and would provide backup in case of damage to water infrastructure;

(b) To reduce the turbidity of surface water during and after storm events, additional sedimentation tanks will be installed near the river intakes;

(c) Impluviums from lining volcanic cinder cones will be created to collect rainfall for irrigation of food crops. This would remove the pressure of irrigation from other sources during the dry season; and

(d) Livestock troughs will be provided across the country to reduce the risk of livestock mortality.

II. Overall remarks from the independent TAP

59. The independent TAP recommends this project be approved by the Board.

[21] Demand side improvements include workshops and awareness-raising programmes on water conservation.

Independent Technical Advisory Panel's review of FP095

Proposal name:	Transforming Financial Systems for Climate (TFSC programme)
Accredited entity:	Agence Française de Développement (AFD)
Project/programme size:	Large

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: High*

1. In 2006, the sustainable use of natural resources and energy finance (SUNREF) initiative was developed by the Agence Française de Développement (AFD) to promote investments in energy and environmental services in developing countries. The funding proposal is built on this past experience of the accredited entity (AE) and aims to go beyond the SUNREF programme by diversifying the initiative. This will be done by creating additional adaptation activities in sectors such as agriculture, water, and sustainable housing, and enhancing mitigation commitments through additional innovative projects in green infrastructure, waste management, forestry, and energy efficiency in buildings.

2. As highlighted in the funding proposal, the goal of this programme is to generate a snowball effect among local financial institutions to increasingly, and independently, propose green financial products to their customers.

3. The funding proposal includes an on-lending programme to be funded jointly by GCF and AFD to provide concessional loans and technical assistance to local financial partners (LFPs). The total cost of the programme is EUR 653 million, with 37 per cent from GCF. From this 37 per cent, 12.9 per cent is a grant and the rest is a concessional loan. An additional EUR 246 million in loans is projected to be leveraged from local financial partners and EUR 613 million in equity is projected from project sponsors, bringing the total leveraged programme size to EUR 1,512 million. The executing entity for the public LFPs will be AFD, and AFD affiliate Proparco (the executing entity for private LFPs) is responsible for the private sector.

4. The funding proposal has two components:

(a) Component 1 considers disbursement of concessional loans to LFPs with adapted financial incentives and eligibility criteria tailored to foster the best local climate investments. The funds provided under the programme for LFPs will be on-lent to the final beneficiaries for financing investments based on eligibility criteria defined per country. An indicative category list of climate change related technologies is provided in Annex A to the funding proposal. Allocation for this component is 94 per cent of the total, with 34 per cent from GCF. Distribution planned for mitigation and adaptation projects is 60:40, respectively; and

(b) Component 2 is the key component of this proposal and is dedicated to technical assistance (TA) programmes for LFPs. This component aims to support and expand the private sector players in the financing market for climate investments by strengthening LFPs. The TA programme aims to remove technical barriers for both LFPs and project developers. TA includes: support for the identification and development of eligible and bankable climate-related projects; assistance with the management of environmental and social risks; support for the definition and implementation of a gender policy;

support for marketing and communication activities; assistance in establishment of climate change related bankable projects pipelines and performance monitoring processes; support in development of all other necessary skills and documentation necessary for GCF accreditation whenever LFPs are ready and wish to get it. Based on the experience gained during the implementation of the SUNREF programme, the AE confirms that the TA approach could be revised so that TA management units are implemented in every country rather than at a regional scale, as was the case in the previous programme, so that experts can provide more accurate expertise. AFD will also consider collaborating with local entities/project management units to foster the development of national expertise. Allocation for this component is 5.8 per cent of the total, with the largest share of 82 per cent from GCF.

5. As a result of these activities, the programme will:

(a) Provide LFPs and their clients with concessional loans that have tariffs/incentives tailored to climate investments needs;

(b) Provide grants to build LFP capacities and assist companies in structuring their climate investments through the technical assistance provided; and

(c) Feed into the public policies of the governments concerned (as well as through the grants dedicated to technical assistance).

6. The impact of the programme envisaged will be high with regard to crowding-in private investors in the climate change risk mitigation financing process and strengthening the potential of LFPs to become direct access entities (DAEs). This should eventually lead to high emission reductions and strengthening of the adaptive capacities of countries.

7. In particular, the mitigation impact envisaged is 36,000,000 tonnes of carbon dioxide (tCO_2) over 20 years. The adaptation impact envisaged is: 1 million direct and indirect beneficiaries; EUR 344 million in physical assets made more resilient to climate change; 170,000 men and women with year-round access to a reliable and safe water supply despite climate shocks and stresses; 38,000 households attaining sustainable food security (in areas/periods at risk of climate change impacts); and 14 institutional and regulatory systems implemented that improve incentives for climate resilience and their effective implementation.

1.2 Paradigm shift potential *Scale: High*

8. This programme has high potential for paradigm shift, which implies an increase in the number of potential DAEs in non-Annex I countries and particularly in African countries (specifically in the following 16 African countries: Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Egypt, Kenya, Madagascar, Mauritius, Morocco, Namibia, Nigeria, Senegal, South Africa, Togo, Uganda and the United Republic of Tanzania) as well as in one country from Latin America: Ecuador. This will be done by increasing the capacity of local financial partners (private banks) through aggressive on-the-job capacity-building programmes, including during the operational phase.

9. Dedicated climate change units will be integrated within the LFPs structure.

10. The expected range of beneficiaries for this programme, depending on the countries' needs and local context, is quite broad: companies operating in the targeted countries investing in low-carbon/adaptation/resource-efficient projects and innovations; small and medium-sized companies, managed or owned by women; industrial sectors (e.g. water, agriculture, power); recipients in remote or underserved areas; vulnerable communities (women, young people); cooperatives in the agriculture sector; and, on a case-by-case basis, individuals can be targeted (mostly in the case of microfinance institutions) as well as municipalities.

11. Transformational changes in the approaches of the AE are planned as well, which has high importance for the global-level implementation of GCF targets.

1.3 Sustainable development potential Scale*: Medium*

12. Activities planned by the programme include upscaling and continuing the SUNREF programme, which already focuses on sustainable development, in the context of climate change. This programme, which was implemented by the AE, promotes sustainable natural resources development and focuses on sustainable development goals. The funding proposal will continue the previous approach and is highly likely to contribute to the improvement of most sustainable development goals. This and other programmatic approaches reflect cases where some GCF investment criteria couldn't be properly assessed at the application stage when details and specific projects are not yet known.

13. The scale of this criteria has been assessed based on the past experience of the AE in implementing the SUNREF programme and on the indicative list of technologies recommended for the sectors provided in Annex A to the funding proposal. Therefore, the criteria were scaled as "medium".

1.4 Needs of the recipient *Scale: High*

14. Details of country needs are well elaborated in the country forms (analytical information about the countries) provided by the AE as annexes to the FP.

15. The needs identified for most of the participant countries are well presented in the barrier analysis and are grouped as follows:

(a) **Technical barriers**: limited access to climate change related technologies; technological risk (underperformance of technology) at the operation and maintenance stage; insufficient experience of LFPs and private sector companies in creating commercially viable climate related projects; lack of technical knowhow among LFPs and private sector companies to assess the financial and technical feasibility of climate related loan applications and investment proposals;

(b) **Policy and regulatory barriers**: lack of legal structures and systems to push the market and open up the sector; lack of climate and environmental regulation and legally binding targets, which are often a hindrance to progress in the sector; lack of incentives for climate investments; lack of planning, policy and regulation capacity in the sectors considered by the programme; and

(c) **Financial barriers**: high perceived risk of climate related investments; limited or inappropriate financial instruments (interest rate and tenor) to incentivize investments; preference for short-term rather than long-term benefits, lack of attractiveness of climate finance resources; lack of financing structures and systems; the high cost of capital, etc.

16. All these key barriers and other accompanying impediments will be addressed by the programme.

1.5 Country ownership — Scale*: Medium*

17. This criterion also belongs to the category, which couldn't be assessed during this review process with high probability due to the possibility of programmatic approaches where the target stakeholder is from the private sector and has an agenda that does not necessarily contribute to the governments' social and environmental commitments. At the later stages, the monitoring results will show the actual ownership from participant countries.

18. However, at this stage of assessment, it could be confirmed that:

(a) Country ownership of this programme is confirmed by the no-objection letter provided by the national designated authorities from each participant country;

(b) The country forms (provided as annexes) describe how the programme will contribute to existing climate policies and nationally determined contributions (NDCs) in each target country, which means that at the sector and project level country ownership would be high if the programme is successfully implemented; and

(c) The AE claims in the funding proposal that maximum climate and development impacts in line with the local public policies and NDCs will be ensured. This commitment is supported by the new AFD Climate Strategy for 2017-2022. The first commitment of the AFD is to ensure a 100 per cent Paris Agreement-compatible activity, in particular making all interventions consistent with low-carbon and climate-resilient development and supporting countries in their formulation of low-carbon and climate-resilient development trajectories.

19. Because of high uncertainty regarding this criterion, it is scaled as "medium".

1.6 Efficiency and effectiveness — *Scale: Medium to High*

20. The concept offered by this funding proposal could have a significant impact on enhancing DAEs, which is a modality requested by the Governing Instrument for the GCF. However, this programme could have a dual nature:

(a) A negative aspect is that, in general, similar implementation schemes, such as re-lending to the local financial institutions as a programmatic approach, might significantly slow down establishing/strengthening local capacity-building for DAEs;

(b) Some positive aspects, in this particular case, include the aggressive on-the-job capacity-building of the local financial institutions supporting them in the development of climate change strategies for the banks; the creation of operational manuals with sector related eligibility criteria and monitoring methodologies; the identification of priority sectors and initial project pipelines for each LFP based on the country's priorities and market conditions; and the establishment of climate change units/teams; and

(c) An additional positive aspect is that AFD has submitted a programme that responds to the countries' transition challenges and to the expectations of the Paris Agreement, which requires the enhancement of its approach to the climate-development nexus. Therefore, AFD plans transformational change in its own approach by shifting from one oriented toward the direct impacts of projects to one that actively seeks consistency for all interventions with low-carbon and climate-resilient development pathways.

21. Based on these pros and cons the effectiveness of the funding proposal is scaled as "medium" at this stage of the assessment.

22. 1,800,000 tCO_2 is committed by the project to be reduced annually through the installation and rehabilitation of 280 megawatts of low emission energy. This will save 200 gigawatt hours of energy and improve the energy intensity of buildings, cities, industries and appliances, ensuring sustainable management of 40,000 hectares of degraded lands and forests.

23. The total emission reduction committed by the funding proposal over the 20 years of the project lifetime equals 36,000,000 tCO_2, which equals EUR 18.1 per tCO_2. For total GCF investment, the cost will be about EUR 6.7 per tCO_2, but considering only grant amount it will be 0.9 EUR. From this perspective, the efficiency is considered as "high" even without considering the adaptation impact of the programme (as considered in paragraph 7).

II. Overall remarks from the independent Technical Advisory Panel

24. The opinion of the independent Technical Advisory Panel (TAP) is that the concept offered by the AE could have a dual impact: it could either slow down the accreditation of DAEs or strengthen and accelerate it. The TAP considers this a 50/50 probability. However, the TAP also takes into consideration the following: that a re-lending mechanism is allowed by GCF policy; that the funding proposal could significantly contribute to the implementation of decision GCF/B.14/09; and that the Conference of the Parties to the United Nations Framework Convention on Climate Change through decision 10/CP.22 requested the Board facilitate an increase in the amount of direct access proposals in the pipeline and report back on progress made in this regard. Considering the above, the independent TAP recommends the funding proposal for approval by the Board subject to the following conditions:

(a) Prior to the first disbursement of reimbursable funds by GCF under the funded activity agreement, the AE shall deliver an operations manual, in a form and substance satisfactory to the Secretariat, detailing the implementation of the programme and eligibility criteria for the selection of sub-projects. The programme eligibility criteria shall be in line with the eligibility criteria in the funding proposal and the GCF investment criteria (as per the results management framework), and shall take into consideration the expected impact by different sectors;

(b) Prior to the first disbursement of GCF reimbursable funds under the funded activity agreement to an LFP, the AE shall deliver a written confirmation, in a form and substance satisfactory to the Secretariat, that the LFP(s):

  (i) has sufficient internal capacity to disburse eligible sub-loans in compliance with the operations manual, or

  (ii) has received technical assistance to build sufficient capacity to disburse eligible sub-loans in compliance with the operations manual; and

(c) Except for the first disbursement, the AE shall deliver to GCF, together with the disbursement request, a written confirmation, issued by an authorized officer of the AE, that the sub-projects being implemented under the programme are in compliance with the criteria set in the operations manual and it shall report ongoing status of implementation of the Programme.

Independent Technical Advisory Panel's review of FP096

Proposal name:	DRC Mini-grid Programme
Accredited entity:	African Development Bank (AfDB)
Project/programme size:	Medium

I. Assessment of the independent Technical Advisory Panel

1.1 Introduction

1. Grid power supply in the Democratic Republic of the Congo (DRC) is dominated by hydropower (approximately 95 per cent) and is available only in the southern part of the country. The Société Nationale d'Electricité (SNEL), the national electricity utility company, accounts for 94 per cent of the total installed capacity (2,677 MW), and nearly all electricity is produced from hydropower with the rest supplied by fossil fuels. SNEL owns some of the diesel-based generator sets (also known as "gensets") used to supply off-grid electricity to consumers existing outside of the current grid boundary. Grid infrastructure is absent in the central and northern parts of the DRC. Cities in these areas, where electricity is available, rely on standalone diesel generation (or, in a few cases, mini- and micro-grids), whose generation facilities are mostly diesel fuelled.

2. Many consumers in the central and northern parts of the DRC also rely on biomass resources to meet their energy needs. The high dependence on hydropower and decreasing rainfall, which has been attributed to climate change impacts in the country, has translated over the years into increased reliance on fossil fuels to meet power demands within and outside the main grid boundaries. It has also resulted in increased demand for biomass to meet energy needs in the country, which has been recorded as promoting increased deforestation and forest degradation with serious implications for forest ecosystems and a net potential to contribute to increased national greenhouse gas (GHG) emissions (reduced sequestration) if action is not taken now.

3. The future development of the power sector in the DRC is expected to increase power generation to improve the low level of access to electricity (current national average is around 10 per cent). However, the impact of climate change and variability on rainfall patterns in the country will not only negatively affect the country's ability to extend grid generation to other parts of the country; it will also lead to an increase in dependence on fossil fuels and biomass to meet current and future energy demands. The intervention proposed in this funding proposal submitted by the African Development Bank (AfDB) will help establish a low-carbon pathway for meeting the electricity demand of consumers in three selected cities in northern DRC while also helping improve electricity access.

4. The AfDB/GCF Green Mini-grid Programme was planned and conceptualized to replace the baseline situation and what would have continued to evolve in the absence of the current intervention in the three cities. The baseline situation currently involves electricity supply through small scattered diesel generators (and in some cases by diesel-based mini-grids) as well as from kerosene lamps and battery torches for lighting. AfDB and GCF will pilot the innovative Green Mini-grid Programme, with mini-grids powered by a solar/battery electricity storage system (BESS) hybrid. The programme also analysed an alternative of having a 100 per cent BESS in the hybrid system design with solar photovoltaics (PV) that can supply electricity during the hours of the day when solar irradiation is not available. The analyses

showed that the capital expenditure (CAPEX) of this alternative is about 2.4 times that of the adopted system (a diesel backup to supply electricity whenever the solar irradiation is no longer available and when the BESS system storage has been discharged). The analyses also showed that the system with 100 per cent BESS backup for the solar PV system (i.e. without diesel backup), if adopted for this project, will lead to a more than 45 per cent higher tariff compared to a project where the diesel system would complement the BESS to ensure system stability and 24-hour service with a maximum share of the energy produced by the PV plant. The system with a diesel backup has been chosen for this intervention, as this backup system is needed if the intervention is to deliver electricity to residential consumers at an affordable tariff level, especially for residential consumers. A comparative analysis of the three options (100 per cent diesel facility; PV/battery storage/diesel backup; and PV/battery storage/zero diesel) is presented in table 1 below.

Table 1: Cost comparison of different generation options (for the case of Isiro)

	Option 1 (baseline) 100% diesel	**Option 2 Solar hybrid system with battery storage**	**Option 3 Solar only system with battery storage**
Overall generation capacity	2.9 megawatts (MW) (generator set (genset))	5.5 MW photovoltaics (PV) 2 MW (genset) 11 MWh (battery)	14 MW (PV) 24 MWh (battery)
% share of renewable energy	0 %	85%	100%
Diesel consumption (kilolitres over the life of the project)	68,468	10,249	-
Greenhouse gas emissions avoided (tonnes of carbon dioxide equivalent (tCO_2eq) over the life of the project)	-	178,785	211,928
Generation capital expenditure	USD 1.2 million	USD 13.8 million	USD 33.8 million
Levelized cost of electricity	USD 0.62/kilowatt hour (kWh)[a]	USD 0.43/kWh	USD 0.64/kWh
Cost metric of ER process [b]		USD 77.2/tCO_2e	USD 159.5/tCO_2e

Source: Data based on estimates of from the Essor programme by the Department for International Development of the United Kingdom of Great Britain and Northern Ireland and the African Development Bank.

[a] The figure assumes a large centralized and fuel-efficient diesel generator-based mini-grid system. The actual cost of supply is higher (in excess of 1 USD/kWh) as the diesel gensets are small scattered units operating on low fuel efficiency. Further, it may be noted that the capital structure of Options 2 and 3 is different from Option 1, as Options 2 and 3 assume a significant proportion of grant financing, whereas Option 1 is commercially financed, inherently making Options 2 and 3 cheaper.

[b] The lower the cost metric, the more efficient the ER scheme.

Abbreviations: ER = Emission Reduction.

5. This Green Mini-grid Programme is aimed at piloting an innovative intervention that will:

(a) Finance three solar hybrid mini-grid projects, each targeted at a selected city/town (Isiro, Bumba and Genema) in the northern part of DRC, through a competitive bidding/tendering process;

(b) Each of the three projects aims to provide:

(i) A hybrid PV power plant with 5–10 MW capacity;

(ii) An associated distribution network to reach all types of consumers within the community to be served;

(iii) An overall number of connections expected to reach about 12,400 in the first year, rising to about 23,300 in the fifth year; and

(iv) A configured system expected to provide 24 hours of electricity, seven days a week.

(c) Procurement for the three projects will be handled by a public agency within the Ministry of Energy Hydraulic Resources (MEHR), namely, the Unite de Coordination et de Management (UCM); and

(d) Have a total cost of USD 89 million, which will be financed through: senior debt of USD 20 million from GCF; a senior loan of USD 20 million from AfDB; and equity and quasi-equity (including an investment grant) of USD 47 million. The total also includes USD 1 million each from AfDB and GCF as a grant to fund a technical assistance programme.

6. Under the financing programme, AfDB will set aside a sum of USD 1 million as a grant for complimentary technical assistance for the Sustainable Energy Fund for Africa, which, together with another USD 1 million grant from GCF, will fund the following programme-related activities:

(a) Project preparation for the three projects covering environmental and social (E&S) and technical studies, and pre-feasibility studies of other sites;

(b) Strengthening of the enabling framework for green mini-grid development in the DRC;

(c) Building of key institutional capacity to manage and implement green mini-grid projects; and

(d) Support for project-level preparations of the three mini-grids as well as additional mini-grids at other sites in the DRC.

7. It is important to stress that the GCF senior loan (USD 20 million) will only be used to finance renewable energy assets (solar PV and batteries). Anticipated contributions from other development partners in the form of grants or other quasi-equity is expected to support the financing of the standby gensets and household connections, which will serve as public infrastructure to enable a 24-hour energy supply to consumers.

1.2 Impact potential *Scale: High*

1.2.1 Expected impacts

8. The three mini-grids, when operational, will displace about 85 per cent of the diesel fuel that would have been required to generate the same quantity of electricity in a typical year that the programme's power system (solar PV/BESS/diesel backup) would have generated. The successful implementation of this pilot programme will result in the following potential impacts:

(a) The displacement of a significant quantity of the more carbon-intensive diesel fuel by the lower carbon system that will be deployed under this programme will result in GHG

mitigation through the reduction in GHG emissions compared to what would have happened in the absence of this programme;

(b) Successful implementation of this project will result in improved access to electricity by the consumers who will be connected to this low-carbon system through the programme; and

(c) The success of this programme will also enhance the replication and scalability of the programme to other towns and communities in areas not reached by the national grid. The population to be impacted will also have improved access to electricity.

9. Key potential impact indicators of the proposed Green Mini-grid Programme can be summarized as follows:

(a) The intervention in the three towns, which will be ring-fenced for this programme, will result in an estimated annual GHG emissions reduction estimated to be around 28,000 tCO_2eq (average). For a 20-year lifetime of the system, this will amount to around 560,000 tCO_2eq;

(b) It is estimated that 150,000 people in the three selected towns will directly benefit from the availability of a more reliable and clean supply of electricity, which will enhance their quality of life through improved access to modern and clean electricity; and

(c) The Green Mini-grid Programme in the three towns in northern DRC is expected to have high replication and scalability potential. As such, the success of the pilot programme will lead to replication in the other non-priority towns in the future. It is estimated that up to 51 million people in the DRC could be connected to the mini-grids once a viable model is established through this successful pilot programme.

1.2.2 Detailed methodology used for calculating the impact indicators

Greenhouse gas accounting methodology

10. The off-grid electrification methodologies used in the CDM standard baselines AMS-1. A and AMS-1. L (for the electrification of rural communities using renewable energy) has been applied. These methodologies are applicable for this programme because:

(a) The three selected towns are not connected to the grid;

(b) The selected towns are not likely to be connected to the grid in the short to medium term;

(c) Electricity supplies in the towns are currently provided by SNEL and the municipalities through diesel Gensets, which function only for a few hours and cover only small portions of the towns. In the last ten years, most of these diesel-powered mini-grids have broken down and consumers (residential, commercial and industrial) have resorted to using their own on-site diesel generators, kerosene lanterns and battery-operated torches for lighting, and biomass for other energy needs;

(d) Optimum scenario data from a carefully implemented demand survey were used to calculate the baseline and project emissions in line with the approved United Nations Framework Convention on Climate Change (UNFCCC) baseline and monitoring methodologies;

(e) The result of the GHG emission reduction calculations showed that the project will generate an average of about 5,900 tCO_2eq /year and a total of 118,000 tCO_2eq over 20 years. If the same project electricity generation profile is implemented through a 100 per cent diesel power-based system, the emissions will go up to about

678,000 tCO_2eq over 20 years. Thus, the project will lead to an avoidance of GHG emissions totalling 560,000 tCO_2eq over that period; and

(f) The Green Mini-grid Programme, which is a pilot intervention, will reduce global emissions by an estimated 560,000 tCO_2eq with a total GCF investment of USD 21 million at a cost of USD 37.50 per tCO_2eq, or USD 77.20 per tCO_2eq on the basis of the overall project cost.

1.2.3 Expected total number of beneficiaries

11. The Green Mini-grid Programme is expected to connect 21,200 households and 2,100 small and medium-sized enterprises (SMEs) over the first five years of AfDB/GCF direct investment. According to a United Nations study, an average household size in the DRC is 5.3 people. It has also been assumed that each SME has an average of 20 employees, which is closer to the definition of micro-enterprise than to an SME, which is commonly defined as an enterprise employing less than 250 people. With the estimated 20 people per enterprise, it is estimated that at least 150,000 people will benefit directly from the clean electricity that will be generated by the pilot programme.

12. Accordingly, the impact potential of the proposed programme is assessed as “High”.

1.3 Paradigm shift potential Scale*: Medium*

1.3.1 Key paradigm shift issues are summarized below

Potential for scaling up and replication

13. The Green Mini-grid Programme will provide senior debt to carefully selected private mini-grid project sponsors that would have been identified the in the Essor programme (A2E Phase 1) supported by the United Kingdom of Great Britain and Northern Ireland Department for International Development (DFID). In the absence of the AfDB/GCF financial support, it would have been impossible for these private sector mini-grid project sponsors to source such debt funding needed for the implementation of the project. Thus, the successful financing of these projects using AfDB/GCF concessional debt funding will open the opportunity for private sector investment in mini-grid development in other already identified towns in the northern parts of DRC. The potential for scaling up and replicating the successful pilot programme will not only be enhanced due to the lessons to be learned from debt financing. It will also result from the fact that this AfDB/GCF intervention has a grant component for supporting the necessary technical assistance programme for relevant institutional and regulatory systems of the Government of DRC that will be needed for managing mini-grid development and its operation and maintenance. The financing model will also assist in crowding in private financing over time to further enhance the potential for the scaling up and replication of the programme in DRC and the region. According to the information provided by the sponsor, the ambition of the programme, if the pilot phase proves to be successful, is to replicate the tender offer to 10 to 15 other large towns in the DRC. The replication phase will therefore benefit from a successful pilot phase, and as such, the funding proposal states that a number of potential provinces for the replication of the pilot programme have been identified and detailed studies on these cases have been scheduled as part of the pilot funding programme.

14. The current arrangement whereby the accredited entity (AE) will also serve as the executing entity (EE) may not deliver over time. Local teams (within the private sector entities who will invest in future green mini-grids in the DRC) who are able to carry out the critical assignments in executing future replication projects. This weakness can be eliminated if, right from the start of this pilot scheme, a program to develop such a local team, is put in place to

facilitate an intensive learning process. It can be concluded that the potential to scale up this green mini-grid initiative throughout the DRC and perhaps beyond can be significant, especially if attention is paid to the development of a cluster of local professionals who will eventually be engaged by private sector investors for future green mini-grid development.

Potential for knowledge and learning

15. The success of the AfDB/GCF Green Mini-grid Programme, which is a pilot for the DRC, will definitely generate highly valuable information on how to plan and implement such clean mini-grids in the country. Such information will be useful not only for the replication of this success in the other towns identified for mini-grid development but can also serve as a basis for knowledge-sharing and learning for similar projects in the region. The programme will generate knowledge that will inform the design and implementation of similar green mini-grid programmes across the country and in the region. The knowledge and information base will include lessons learned from the green mini-grid tendering process and financing, which can be distilled and shared systematically through the AfDB and GCF knowledge network.

16. Apart from pertinent knowledge and information on green mini-grids that will be generated through the proposed AfDB/GCF support to this programme, the technical assistance grant funding will also ensure that such knowledge and information is transferred to institutions that will be responsible for or have critical roles in scaling-up the kind of sustainable energy generation and distribution planned under this proposed programme. The capacity-building planned as part of the technical assistance support for this proposed funding will complement the AfDB/DFID Essor A2E plan to scale up and replicate this model in other DRC regions and/or other countries where needs are identified. This programme is essential to build a commercially viable model for future AfDB engagement in the sector. This will enable AfDB to have a list of what works and what does not when planning and implementing mini-grid programmes in other African countries. AfDB will therefore be able to play a role of knowledge broker to ensure that the ambitious goals under the New Deal on Energy for Africa can be attained with continuous learning and scaling up in other countries in Africa.

17. As pointed out in the previous section, a higher score on the potential for knowledge and learning will be achieved if a dedicated scheme is included in the pilot scheme to train qualified personnel working for the identified private sector investors so they can execute future green mini-grid programmes in other cities after the pilot programme. The dedicated scheme will enable a local team to act as understudies for the AfDB EE team over the period of the pilot programme and emerge with tools, knowledge and capabilities to plan and deliver the next mini-grid project.

Contribution to creating an enabling environment

18. The proposed AfDB/GCF intervention is innovative in terms of how it will result in the flow of private sector funding into the development of green mini-grid programmes in the DRC and the region. Specifically, the intervention will involve auctioning to the private sector new concessions covering the design, financing, construction and operation of large urban independent grids supplied by solar hybrid power generation systems. The propensity of this intervention to create an enabling environment was stressed in the funding proposal, where it was stated that this type of auctioning is the first of its kind in terms of business model, as the size of the projects exceeds typical mini-grid projects targeting rural areas which have been developed so far in the DRC and in other African countries. The independent Technical Advisory Panel (TAP) believes that if the proposed initiative is able to achieve its implicit objective of accelerating, optimizing and standardizing the development of mini-grids across the country through the generation of bankable opportunities for the private sector, then a robust structure which can be replicated in various locations in the DRC and the region will be created.

19. In addition, the technical assistance component of this AfDB/GCF intervention is likely to produce a path to sustainability beyond the current intervention since the capacity of key

sector institutions, especially the UCM, will be enhanced. Specifically, the capacity of UCM to coordinate and conduct the green mini-grid project tendering process, which is expected to be built (and/or strengthened) through its involvement in the implementation of this proposed intervention, and the capacity-building included in the technical assistance portion, will equip staff with the requisite skills to coordinate and replicate private-led mini-grid projects in the future. This is particularly important given that in the DRC, the Electricity Law of 2014 now allows for the concession of generation and distribution to the private sector. An enabling environment for the planning, development and implementation of the Green Mini-grid Programme in the DRC and beyond will also be created and strengthened with time through the mobilization of relevant public authorities, renewable energy project companies and industry players, investors, civil society groups, research and sector experts, and development partners, including development financing institutions who will be identified and engaged by this proposed intervention. A weak point in the technical assistance intervention of this programme, is the absence of focal capacity building for local technical and engineering teams, who will eventually work in the energy project companies that will replicate this pilot programme in the other towns in the Democratic Republic of the Congo (DRC). This weakness may not allow the potential paradigm shift that can be generated by this programme to be as high as it should be.

Contribution to regulatory framework and policies

20. Key regulatory frameworks/policies that are in place even before the commencement of the AfDB/GCF Green Mini-grid Programme include:

(a) The "Growth and Poverty Reduction Strategy Papers" 1 and 2, adopted in 2006 and 2012, respectively, which underline the importance of the energy sector in the socioeconomic development of the country and which have an ultimate objective of ensuring that access to reliable electricity reaches the entire nation;

(b) The Five-Year Action Plan 2007–2011, which is an energy policy and regulatory framework to facilitate the rapid expansion of access to energy services for the entire population; and

(c) The Electricity Act 2014, which is aimed at attracting private sector investment through measures including sector liberalization and the establishment of the sector regulatory authority and agency for rural energy services.

21. The successful implementation of the AfDB/GCF Mini-grid Programme, which is the focus of the funding proposal under consideration, will help facilitate the strategy that will improve electricity access in each of the three towns covered by this intervention. Furthermore, lessons learned in programme implementation will also contribute to the replication of the programme in the other identified towns that do not have grid connection and where electricity is currently supplied by a combination of diesel generation, kerosene and battery-powered torches for lighting, and biomass for other energy needs of consumers. Electricity access will be further enhanced through programme replication. It can therefore be concluded that the programme will help achieve the ultimate objective of the three regulatory frameworks and policies listed above.

22. The combination of the potential of the proposed programme to enhance the scaling up and replicability of the Green Mini-grid Programme beyond the initial pilot towns to other identified towns in the DRC; the fact that the proposed programme has been developed to promote knowledge-sharing and capacity-building for critical stakeholders; the fact that the programme will enhance the goals and objectives of the national regulatory frameworks and policies through improved electricity access adequately point to possible paradigm shift potential.

23. The independent TAP therefore assessed the paradigm shift potential of the intervention as "Medium".

1.4 Sustainable development potential *Scale: High*

24. The key sustainable dvelopment benefits of the programme can be summarized as follows.

Environmental co-benefits

25. The successful implementation of this Green Mini-grid Programme will deliver significant annual GHG emission reduction. A key environmental co-benefit is the fact that by reducing diesel use (which would have been used to generate electricity in the mini-grid to supply consumers in the three towns) by around 85 per cent, the project will also deliver:

(a) A significant reduction in principal air pollutants: the oxides of sulphur (SO_2 and SO_3), the oxides of nitrogen (NO and NO_2), and particulates that would have been released into the atmosphere if the displaced diesel was fired in the status quo power generation system. These primary pollutants are known to interact with the environment once released to generate deleterious effects such as acid rain, smog, etc., which has been linked to several health effects; and

(b) A reduction in indoor pollution from kerosene lighting by households within the captive consumers' home that would have manifested in the absence of the Green Mini-grid Programme.

Social co-benefits

26. The successful implementation of the Green Mini-grid Programme is expected to improve electricity access in the communities that will be served by the programme. Electricity access in these northern towns is close to the national average of 10 per cent and is even lower in peri-urban parts of the towns. Increasing access to these consumers 24 hours a day and seven days a week will yield, among other co-benefits, the following:

(a) Positive social and welfare impacts, especially in promoting education and health through the regular and reliable powering of public facilities such as schools and hospitals;

(b) Better standard of living within the home (comfort, better lighting, etc.);

(c) Higher educational performance, as electricity will then be available in schools at all levels in the covered towns, thus removing the barriers that, in the status quo ante, hindered practical teaching methods that usually require electrical appliances;

(d) Wider use of information and communication technologies that will facilitate access to information and knowledge;

(e) Increased frequency of medical interventions and the conservation of medical products by health institutions in the towns, thus improving access to and delivery of healthcare resulting in positive health benefits for the people;

(f) Better health of the people through improvements to the municipal water system run by the public water utility (Regideso). With access to a viable source of electricity, Regideso should be able to provide continuous service, expand its network throughout the city and ensure better hygiene and sanitation principles in its water supply activities compared to the status quo ante situation;

(g) Substantial health benefits through the reduction of toxic emissions from diesel and kerosene; and

(h) Lowered fire risk from the use of kerosene lamps and wood for lighting and reduction in the incidence of respiratory and eye diseases.

Economic co-benefits

27. Key economic co-benefits of this proposed intervention can be summarized as follows:

(a) The improved availability of reliable and clean electricity from the facilities will enable households and businesses in the three covered towns to boost their positive social and economic activities;

(b) The status quo ante delivery of electricity to consumers in the three towns in the baseline is carried out via:

(i) Small auto producers with diesel generators;

(ii) The very unreliable and barely operating SNEL network; and

(iii) Solar home systems for a few households, which means the electricity tariff is very high, with prices reaching between USD 1.20/kWh and USD 1.50/kWh.

(c) With the successful implementation of the planned mini-grid, these consumers will be delivered green electricity with blended tariffs not higher than USD 0.43/kWh. Details on the indicative tariff for each class of consumers as estimated for each of the three towns are shown in the table below:

Table 2: Indicative tariff structure (in USD/kWh)[a]

KWh Range/month	Bumba	Gemena	Isiro
0 – 15kWH	0.29	0.32	0.30
15 – 50kWh	0.33	0.40	0.40
50 – 100 kWh	0.42	0.50	0.45
> 100kWh	0.55	0.50	0.50
Regideso	0.42	0.50	0.50
Blended tariff	0.45	0.43	0.43

[a] Regideso is the water utility of the DRC and is an "anchor consumer" for the electricity from the green mini-grids.

(d) Economic savings will be induced at both household and business levels in each of the three towns. Households will be able to benefit from economic savings because of the reduced tariffs, which will result from the shift to electricity from the green mini-grid instead of the inefficient and expensive means of lighting using kerosene lanterns and dry cell battery lamps;

(e) For similar reasons, local businesses will be able to increase production and reduce energy-related costs in their daily operations;

(f) The programme itself will create job and income opportunities related to the operation, repair and maintenance of the systems;

(g) The programme will reduce the vulnerability of households and local businesses to fossil fuel price fluctuations; and

(h) At the macro level, the Government of the DRC will benefit in terms of balance of trade, since the need for importing diesel will be reduced, which will become significant when the proposed intervention is expanded to other towns in the DRC.

Gender-sensitive development impacts

28. Key gender-sensitive development impacts of the proposed Green Mini-grid Programme can be summarized as follows:

(a) According to the information provided in the funding proposal, which is likely related to the general situation in the DRC, female owners of local businesses face discrimination when accessing grid electricity compared to their male counterparts (e.g. delays in obtaining electrical connections, higher expectations to give bribes to get services, etc.). This discrimination against women is expected to be reduced tremendously when a more progressive electricity supply organization is established, especially through the technical assistance that will be provided to the relevant institutions on using best global practices;

(b) In the status quo ante, rural women are responsible for fetching wood, charcoal or other forms of fuel and burning it to prepare food for all family members. These chores place a very heavy burden on their time and strength. With the availability of a reliable green mini-grid, these women will be able to use their time, which would have been spent on these status quo ante chores, for more productive, income-generating activities, including outside the household;

(c) Since these women will spend less time burning kerosene in the homes to cook when electricity from the green mini-grid is available, their exposure to increased health risks from unsafe fuel burning practices (prevalent in the baseline period) will be eliminated;

(d) In terms of comfort and protection, electrification can lead to the installation of public lighting, which in turn increases the perceived level of security of households, especially for women;

(e) Improved access to electricity can also positively affect women's educational opportunities, which in turn are key for their employment and economic advancement prospects, as lighting increases the time available for studying;

(f) A gender action plan has been developed during the planning stages of the Green Mini-grid Programme and is expected to be implemented as part of the programme. This programme is expected to ensure that gender-balanced green mini-grids are built not only for the pilot programme but also for the replication of follow-up programmes.

29. The combination of co-benefits that is expected from the programme, which includes environmental and social and economic co-benefits, together with the fact that it will enhance women's livelihoods, point to the programme resulting in relatively significant sustainable development in the DRC.

30. The independent TAP therefore scored the AfDB/GCF funding of the Green Mini-grid Programme in the DRC as "High" in the sustainable development potential metrics.

1.5 Needs of the recipient *Scale: High*

31. In this section, we present information on how the AfDB/GCF Green Mini-grid Programme will affect the economic, financial, social and institutional needs of the country.

Economic and social development of the country and the affected population

32. According to the national average, only about 10 per cent of the DRC population has access to modern electricity. This figure hides the wide dichotomy that exists in the country, with the capital Kinshasa having around 44 per cent access and most rural and peri-urban areas having around 1 per cent. A major portion of the grid electricity in the DRC is supplied to

consumers (residential, commercial and industrial, etc.) in the southern part of the country, stretching from east to west, which represents the current capture of the national grid. Despite plans and programmes by the Government of the DRC over the years, efforts to extend the national grid to the central and northern parts of the country have not materialized. Consumers in these parts of the DRC rely on unstable and unreliable electricity from mini-grids operated and maintained by SNEL; electricity from small auto producers with gensets; and solar home systems for a few households. Households also rely on coal and wood for cooking and on kerosene lamps and battery-operated torches for lighting. Thus, on average, status quo ante electricity supply is dominated by diesel fuel systems, causing the kWh price of electricity to consumers in the three towns to range from USD 1.20/kWh to USD 1.50/kWh, a very expensive price when compared to many regional rates.

33. The economic impacts of this poor and expensive supply of electricity to consumers in the three towns can be summarized as follows:

(a) Economic activities in each of the targeted towns, which are primarily driven by agricultural production and agro-industrial processing with individuals or small businesses, will not be able to achieve sustainable growth. This will continue to constitute an important barrier to economic growth in the towns and, by extension, the DRC;

(b) The productive activities of households will also be constrained by inadequate access to electricity and thus constitute an additional barrier to the region and country's economic growth; and

(c) The high price of electricity to consumers, if allowed to continue as in status quo ante, will continue to be a barrier to economic growth and the improvement of the living condition of a vast majority of the people in the DRC.

34. We agree with the notion that was discussed in the funding proposal that access to electricity in these underserved towns is a very crucial issue that must be dealt with to facilitate sound economic development, not only in these towns but in other similar towns that have been identified for the replication of this programme as well as the entire DRC. We therefore conclude that the successful implementation of the Green Mini-grid Programme, including the technical assistance that is expected to ensure replicability in other towns in the country, will definitely greatly enhance the country's economic development and the social well-being of its people.

Financial needs of the country

35. Public investment capacity by the Government of the DRC to expand energy access (e.g. through grid extension and the funding of credible alternatives) is seriously constrained due to its tight budgetary situation. Political and economic instabilities have also deterred participation from private companies and investors. Reasonable and affordable debt terms from local and international financial institutions are hard to come by. Overall there is a lack of capital for power projects in the DRC, which is more severe when it comes to mini-grid projects marked by high perceived risks. As a result, the few mini-grid projects that have been implemented in recent years are concentrated in regions of relatively high economic activity, primarily mining and trading. The three pilot mini-grids proposed will be implemented in areas that do not have the same degree of economic activity, making them relatively challenging from an economic and financial perspective. The availability of concessional debt terms from GCF, supported by a senior debt from AfDB, will create an enabling environment to crowd-in the necessary quasi-equity and equity that will be needed for the total financing of this programme. It will also have a positive impact on the availability and source of funding for the replication projects, as important "learning by doing" lessons will be generated through the successful implementation of the pilot programme, thus reducing the risks and barriers that have made this kind of intervention impossible in recent years.

Need to strengthen institutions and capacity to implement such projects

36. Key institutional actors that will be involved in the implementation of this pilot Green Mini-grid Programme in the three selected towns will include: key government institutions such as UCM, MERH, Establishment of Rural Electrification Agency (ANSER), targeted provincial governments, and investors. The participation of these entities in the pilot programme will have a high demonstration effect and set the bar for replication. Not only will these and other relevant institutions be strengthened, the complementary technical assistance, which was designed to ensure that green mini-grids are scaled-up across the country beyond the pilot phase, will also add to the capacity of these institutions and regulatory and policy entities in the power sector that will be involved in some way in the planning, design and implementation of replication projects in the identified towns.

37. Given the fact that this intervention will score high in improving the economic and social situation of first the affected communities but later the whole country facilitating institution-building and capacity-strengthening, and fostering a market that can attract funding from the local private sector and perhaps from overseas sources, we believe that this Green Mini-grid Programme, if successfully implemented, should largely satisfy the needs of the DRC.

38. The independent TAP therefore scored the need of the recipient as “High”.

1.6 Country ownership *Scale: High*

39. Key country ownership metrics we have identified from the various documents submitted with the request for funding from GCF for this proposed Green Mini-grid Programme can be summarized as follows.

Existence of a national climate strategy and coherence with existing plans and policies

40. Nationally determined contributions (NDCs) constitute a key national climate change strategy submitted to the UNFCCC secretariat by the Government of the DRC. NDCs are at the heart of the Paris Agreement and the long-term goals of other global climate agreements. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement (Article 4, paragraph 2) requires each Party to prepare, communicate and maintain successive NDCs that it intends to achieve. The DRC submitted its intended nationally determined contributions (INDCs) to the UNFCCC secretariat on 18 August 2015. A key objective from this submission is the commitment of the DRC to avoid over 70 $MtCO_2eq$ of GHG emissions per year by 2030 through the deployment of renewable energy. This objective is also consistent with the development plans of the country. The proposed Green Mini-grid Programme will enhance the ability of the DRC to meet its NDC and national plan objectives. In order to achieve the GHG emission reduction target, the central and provincial governments of DRC are supporting strategic reforms in the power sector that include liberalization, increased transparency, and the attraction of a greater number of national and international private and public partners. Key activities that will be funded by the grant portion of the funding sought for this programme will enhance the success of these strategic reforms.

Capacity of accredited and executing entities to deliver results

41. The AE and EE for this proposed programme, as stated in the funding proposal and all reviewed documents, is AfDB. Since AfDB is both AE and EE, and no local entity was proposed to be the EE, the country ownership metrics may seem low. However, two aspects that were well described in the submission that indicate that the successful implementation of the pilot programme will contribute to improved country ownership include:

(a) The proposed pilot programme has been designed and will be implemented using technical assistance funding to build the capacity of relevant local stakeholders, who will participate in the implementation of the pilot programme covering the three selected towns; and

(b) In addition to capacity-building of relevant stakeholders through "learning by doing" efforts during the implementation of the pilot programme, the technical assistance intervention has also been designed to build and strengthen the capacity of local stakeholders such as: private sector entities, who will have equity in the three projects; key government institutions such as UCM, MERH and ANSER, who are expected to be heavily involved in sector issues such as tariff-setting, approval of power purchase agreements, identification of towns where replication of the pilot programme can be carried out, etc. This will also contribute to higher levels of country ownership than at the start time of this intervention.

42. The experience and track record of the AE/EE (AfDB) with respect to its capability of being able to successfully implement the activities they are expected to undertake in the proposed programme can be summarized as follows:

(a) In the funding proposal reviewed, more than seven renewable energy projects have been funded wholly or as part of loan from AfDB, with crowding in of funds from the Global Environment Facility, Climate Investment Funds and other international funding schemes. Total capacity delivered by this AfDB-led intervention amounted to slightly over 1,000 MW over the period 2011–2017, with total AfDB-sourced funding totalling USD 480 million, EUR 134 million and slightly less than XUA 90 million (XUA is AfDB Unit of Account). This experience should support its ability to mobilize its contribution of USD 21 million to this programme and crowd in funds from other sources for the implementation of Component 2 of this program;

(b) AfDB personnel were involved in the planning and execution of all of the seven renewable energy projects mentioned above, including Concentrated Solar Power; Solar Photovoltaic Facilities; Wind; Hydro including Run of the River Small to Medium Hydropower Plants. Experts from AfDB, strengthened by contractors hired and managed by AfDB, participated in all the facets of project identification, planning, design, construction and commissioning. Although not much evidence was provided on the extent of the involvement of local stakeholders in the African countries, which include: Egypt; Kenya; Mali; Morocco; South Africa; Uganda; and Zambia, the fact that technical assistance schemes were packaged into the development and implementation of these renewable energy projects gives hope that some local capacity was developed in each of these countries and will be developed in the DRC;

(c) AfDB approved the financing package of USD 100 million, comprising USD 50 million in equity and USD 50 million in a convertible senior loan, for the Facility for Energy Inclusion (FEI) in late 2016. FEI is positioned as a global facility with two distinctive windows managed by two separate fund managers:

(i) the On-Grid Window (USD 400 million); and

(ii) the Off-Grid Window (USD 100 million).

(d) Fundraising and pipeline-building activities will continue over the next months; and

(e) In addition to the activities discussed above, examples of the support from AfDB to the power sectors of its regional member countries that has and is contributing to increased access to electricity include:

(i) Kenya Last Mile Connectivity Programme, which aims at extending the low voltage network to reach around 1.2 million people, with a total cost of about UA

108.6 million, out of which AfDB is contributing UA 95 million (approximately USD 130 million);

(ii) Burkina Faso: the Electrification Project for Semi-Urban Areas of Ouagadougou and Bobo-Dioulasso, which is aimed at restructuring and expanding the medium and low-voltage distribution networks in the country's two largest towns and establishing 17,500 connections to households. The total project cost is UA 37.76 million. The project will be co-financed by AfDB (72 per cent), Société Nationale d'électricité du Burkina Faso (SONABEL) (15 per cent) and the Government of Burkina Faso (13 per cent); and

(iii) Lesotho: Electricity Supply Project, which was aimed at increasing the country's power supply and reliability as well as electricity access, was successfully completed in 2014 and its Project Completion Report was approved in 2016.

43. These past and ongoing activities of AfDB attest to its ability to successfully act as both the AE and EE for the Green Mini-grid Programme that it has proposed for funding in collaboration with GCF. The capability of AfDB to perform the role earmarked for it in the development of the programme is accentuated by the fact that it is currently the focal point for all mini-grid activities on the continent through its Green Mini-Grids Market Development Programme (GMG MDP). Through the GMG MDP, AfDB offers technical assistance to mini-grid developers and mini-grid policymakers through its Green Mini-Grid Help Desk. AfDB is providing support to more than 60 green mini-grid developers in 30 countries, as well as to several ministries of energy on the continent.

44. AfDB will also have a good learning opportunity in its collaboration with GCF starting in the fourth quarter of 2018, when the recently launched Zambia Renewable Energy Financing Framework, which it is co-financing with GCF, is expected to take-off. The AfDB-GCF financing envelope for this framework aims to provide USD 100 million of senior debt and a standby loan facility (as a tenor extension instrument for commercial banks' loans) to renewable energy feed-in-tariff projects (smaller than 20 MW each) in Zambia. USD 4 million in technical assistance was also arranged to develop the ecosystem and value chain for renewable energy-based electrification in Zambia. This intervention in Zambia will provide a base for AfDB to quickly learn what works and what does not in its collaboration with GCF.

Engagement with the national designated authority, civil society organizations and other relevant stakeholders

45. The engagement of AfDB with the energy sector stakeholders in the DRC for green mini-grid development started years ago with its GMG MDP. This support helped produce a green mini-grid market opportunity assessment in July 2017. This provided reasoning for the preparation of this Green Mini-grid Programme, as the identified towns where the kind of off-grid, mini-grid system in this intervention could be implemented as a pilot. The engagement of relevant stakeholders during the development of the project, which resulted in the preparation of the funding proposal and its annexes that has been submitted to GCF, can be summarized as follows:

(a) The need for AfDB enabling environment support for the Government of the DRC originated from the lessons learned in the implementation of the GMG MDP. This formed the basis for the recent approval by AfDB of USD 1 million in a technical assistance grant for institutional capacity-building and mini-grid project preparation in the DRC;

(b) Close collaboration with the national designated authority (NDA) and key sector stakeholders in the DRC during the preparatory stage was explicitly maintained. For example, the concept of the project was developed in close consultation with the UCM, which is responsible for tendering and granting concessions for the mini-grid projects to

be financed, as well as with the DFID-Essor team, who supported the UCM for the entire preparatory process;

(c) Stakeholders and beneficiaries in the prospective project sites have been consulted during the site selection and subsequent pre-feasibility studies;

(d) Engagement with a wider scope of national and local stakeholders took place during the development of the funding proposal; and

(e) This wider consultation with the active participation of the NDA eventually led to the release of a no-objection letter for the programme, which was received in July 2018.

46. The reasoning presented above, which is well documented in the funding proposal and the annexes submitted on: the compatibility and coherence of the Green Mini-grid Programme of the DRC with National Climate Strategy as embodied in the country's NDCs; the high likelihood that the AEs are capable of implement the programme, given their past experiences in renewable energy project financing, planning and implementation; and the way, manner and The reasoning presented above, which is well documented in the funding proposal and the annexes submitted on: the compatibility and coherence of the Green Mini-grid Programme of the DRC with National Climate Strategy as embodied in the country's NDCs; the high likelihood that the AEs are capable of implement the programme, given their past experiences in renewable energy project financing, planning and implementation; and the way, manner and quality of their engagement with the NDA and other stakeholders points very strongly to a high level of country ownership. However, the fact that no local entity was identified to serve as the EE for this programme weakens country ownership.

47. The independent TAP therefore concluded that country ownership can be scored as "High".

48. However, we will like to place this score at the lower end of a high score due to the absence of explicit indications in the submission that local personnel who will have the capacity to develop and execute the next Green Mini-grid Programme will emerge from the current programme. This may not guarantee high country ownership in the medium term as expected. The independent TAP would therefore like to recommend that the development of a pool of such local personnel who will eventually be employed by private sector investors of future Green Mini-grids should be explicitly built into the proposed pilot programme.

1.7 Efficiency and effectiveness *Scale: High*

49. The assessment of the efficiency and effectiveness of the intervention proposed will be discussed along the following metrics

Cost-effectiveness and efficiency

50. This will be assessed knowing that electricity generated in the status quo, where it is available, is delivered to end users at a very high rate, which is not affordable and is a contributor to the very low electricity access in DRC. The cost-effectiveness of the intervention can therefore be assessed with regard to how far it can deliver electricity at a very affordable price to the poorest consumers in the country. The various barriers responsible for the high tariff in the DRC can be summarized as follows:

(a) There is no availability of public expenditure by the Government of the DRC to carry out capacity expansion of its largely hydro generation-based grid, including investment needed for the extension of the grid beyond the southern parts of the country;

(b) The DRC is known to have the largest hydro resources in the world; it has been said that it can supply all of the electricity needs of Africa for several years. However, a lack of

funds from local and international sources, as well as environmental issues, has been a barrier to such development;

(c) Private sector capital, especially from local financing institutions, is not available for investment in power and other energy projects in the DRC. As such, it has not played a role in expanding the capacity of grid infrastructure over the past decades. Grid and off-grid facilities are more often funded by public funds, and where these fund sources are not forthcoming as we have seen in the recent past, the availability of funds becomes a barrier to investment in power sector infrastructure; and

(d) Renewable energy projects that were implemented in the past few years were funded mostly by bilateral grants from outside the country, funding from provincial governments, equity from public-private partnerships, and equity investors such as the Warren Buffet Foundation; etc. The fact that replication did not follow many of these interventions is an indication that the status quo financing structure had to be tweaked for better performance.

51. This tweak is proposed by this intervention, which aims to deploy green mini-grids in a cost-effective manner and with the objective of providing the lowest end user tariffs possible (below USD 0.40/kWh) while still making returns attractive. To achieve this, a preliminary financial structure envisaged a 45 per cent blended senior debt tranche from AfDB and GCF and a 55 per cent tranche of equity and quasi-equity in the form of reimbursable/investment grants from the sponsor and other financiers. The contributions of AfDB and GCF through the programme will improve the commercial viability of the projects and enable them to provide electricity to a wider share of connections at affordable rates, hence improving electricity access over time in the country. GCF concessional debt funding is particularly critical for the effectiveness of the financial structure proposed. In terms of fund-use efficiency, the indicator includes:

(a) On the basis of the total funding required for the project (USD 87 million), which is expected to deliver a lifetime emissions reduction of about 560,000 tCO_2eq, gives an efficiency indicator of USD 155/tCO_2eq; and

(b) The performance of the concessional fund from GCF can be measured by its efficiency indicator of USD 35/tCO_2eq.

Co-financing, leveraging and mobilized long-term investments

52. The financing structure for this programme has been carefully structured as follows:

(a) GCF concessional senior debt: USD 20 million;

(b) AfDB senior debt: USD 20 million;

(c) Grant/quasi-equity: USD 32 million;

(d) Equity: USD 15 million;

(e) GCF grant: USD 1 million; and

(f) AfDB grant: USD 1 million

53. The concessionality provided by GCF and the better-than-current market rates available for projects in the DRC, both from local and international sources, will anchor the crowding in of adequate equity funds. It will also provide a sound foundation upon which a financing structure for renewable mini-grids can be successfully planned for further replication to other towns in the DRC. Without the concessional funding from GCF, it is doubtful whether the grant/quasi-equity funds currently being discussed and finalized will succeed. The expected co-financing ratio is 1:3.35, with GCF providing close to one fourth of the project cost. This relatively low co-financing ratio should be understood from the consideration of the unique challenge of the

DRC renewable energy and mini-grid market, where private sector co-financing for mini-grid projects is almost non-existent. Furthermore, GCF and AfDB will fund the technical assistance process of the programme, which is essential to the success of the pilot and its replication in other towns, to the tune of USD 2 million. This will be co-financed by GCF and AfDB at a ratio of 1:1.

Financial viability of the proposed Green Mini-grid Programme

54. The pilot programme will be implemented in three towns in the northern part of DRC, which does not currently have grid access and is not expected to have such access in the medium term. A base case using P90 for solar radiation and an energy yield assessment for the debt service coverage ratio (DSCR) analysis, which means that the estimates will be met or exceeded 90 per cent of the time on an annual basis, was assumed in the preliminary financial analysis that was reported in the submission by the AE to the GCF Secretariat. The two metrics that were estimated to determine the financial viability of the programme are: the programme internal rate of return (IRR) and the DSCR. The results of the equity IRR of 16 per cent and DSCR above 1.5x presents a convincing financial case for such projects with its demand risks. The analyses also showed that without the GCF funding, the end user tariff will need to increase by at least USD 0.06–0.07/kWh to maintain the minimum DSCR and keep the equity IRR at a minimum acceptable level in the market. Given the current unfavorable financial market conditions and the risk averse nature of local commercial banks, without the GCF funding it is unlikely that the required private investor funds will flow in.

Application of best practices

55. The experiences of AfDB in identifying, developing and implementing renewable energy projects successfully in African nations will be brought to bear in this proposed programme. These experiences will be targeted at ensuring that international best practices are utilized on the delivery of a quality programme. Furthermore, AfDB, in acting as the EE, will ensure that the competitive bidding process delivers the best available technologies for each component of the programme, from the generation technology to power evacuation and connection to consumers, including metering. The project implementation structure that will be used by AfDB will also ensure that the implementation of the programme will utilize the best international practices and technologies for the solar hybrid mini-grid systems and adjust them for the project environment in the DRC.

56. A key goal of the proposed intervention is the displacement of diesel used in the status quo ante situation to supply electricity to consumers in the three towns. According to the technical set up proposed, 85 per cent of the diesel that would have been required to generate the project electricity for the three towns if diesel genset was utilized will be displaced by the programme. The project diesel will be used to generate electricity during the period of the day when there is no sunlight and when the battery storage system has completely drained. An analysis was carried out as part of the programme development stage to illustrate the system that can completely eliminate diesel consumption in the project system. This will involve the use of a much bigger BESS compared to the setup of the adopted programme. The analyses showed that the CAPEX of this alternative will be about 2.4 times that of the adopted system (a diesel back-up to supply electricity whenever the solar irradiation is no longer available and when the BESS has been discharged). The analyses also showed that the system with 100 per cent BESS back-up for the solar PV system (i.e. without diesel back-up), if adopted for this project, will lead to a more than 45 per cent higher tariff compared to the project case where the diesel system will complement the BESS to ensure system stability and 24 hour service with a maximum share of the energy produced by the PV plant.

57. A recent paper published by the International Renewable Energy Agency[1] indicated that the CAPEX of the concentrated solar power (CSP) facility has dropped in recent years to levels that will make it competitive in a Mini-grid Hybrid System. Given the fact that the CSP facility can serve as a source of baseload electricity as well as a storage facility, it can be technically argued that the solar mini-grid PV system could have been configured to be PV/CSP/BESS, thus completely eliminating the use of diesel. However, the CSP technology is an order of magnitude higher and will need to undergo a period of technology assimilation in a developing country like DRC. The independent TAP is of the professional opinion that the system, as currently proposed, should be utilized to prove that the financial architecture concept, as proposed, will present an opportunity in the market for the financing of green mini-grids. Lessons learned from the proposed pilot will be very valuable in the success of the future replication of the concepts. In replicating the concept, project proponents should be requested, when submitting bids, to take a serious look at the use of CSP as a base load system and as a storage facility to facilitate the complete elimination of diesel fuel in power generation in such systems in the future.

58. Another important issue to stress in support of the fact that the current proposed intervention is considered a best practice as far as the DRC is concerned is the fact that the GCF investment (USD 20 million) is only intended to cover the financing needs for renewable energy assets (i.e. solar PV and batteries in Component 1) and not for infrastructure and any other backup.

59. The infrastructure (power evacuation, connection to consumers, metering system) and the diesel genset backup will be financed with funds from development partners in the form of grants or other quasi-equity to be determined, and discussions are ongoing. This is Component 2 of the proposed intervention.

60. Given the discussions above, the independent TAP rated the efficiency and effectiveness metric of the Green Mini-grid Programme as “High”.

[1] Available at <http://www.solarpaces.org/irena-report-2017-notes-spectacular-cost-reductions-csp/>.

II. Overall remarks from the independent Technical Advisory Panel

61. The argument that a strong paradigm shift and in-country ability to replicate the proposed pilot Green Mini-grid Programme in other towns may not emerge from the successful completion of the pilot programme has been made in Sections 1.3 and 1.6 of this assessment. This is because the pilot scheme did not include strong evidence that the local private sector investors who will build mini-grids after the pilot programme is completed will have a pool of local personnel trained in the art of executing such grids, and who can be available for employment in such organizations for the implementation of future green mini-grids. The capacity-building built into the pilot programme will definitely deliver local capabilities for creating policies, regulations and tariffs, which mainly targets the public sector in the DRC, more need to be done on developing local technical capacity to design and implement Green Micro-Grid beyond the planned allocation for training. A critical mass of local engineers (and other profession relevant to the development of Green Micro-Grids) should be assembled at the start of the program to participate in the project development activities. This will contribute, at the end of the present intervention, to bulding the capacities of the local private sector organizations who are expected to invest in future programmes .Such a team when in place will contribute to making the present pilot intervention to achievea high score on the paradigm shift metric while also endowing it with a very strongly high country ownership.

62. For this to happen, iTAP recommends that prior to the start of the implementation of this programme (i.e. before the first disbursement), the AE should submit to the GCF Secretariat a revised plan for capacity building that will involve the selection of local critical team whose capacity will be built through tangible participation (understudying the main Consultants) in all the work of the EE team that will be put together by the AE. Such a local team should have in place professionals who can: identify sites of future mini-grids; carry out engineering design and the financial/economic analysis of such systems; and carry out all the functions that an EE will be involved in that will deliver mini-grid programmes in other towns in the DRC.

63. The independent TAP therefore recommends that this Green Mini-grid Programme be approved by the Board.

Independent Technical Advisory Panel's review of FP097

Proposal name:	Productive Investment Initiative for Adaptation to Climate Change (CAMBio II)
Accredited entity:	Central American Bank for Economic Integration (CABEI)
Project/programme size:	Small

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale:* N/A

Adaptation impact

1. The primary objective of the project is to increase resilience to climate change of micro, small and medium-sized enterprises (MSMEs) in Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua and Panama by providing access to financial and non-financial services for adopting and implementing climate change adaptation measures.

2. The project will be mostly driven to support agricultural MSMEs in the seven countries, involving 21 financial intermediaries.

3. The project has four components. The first component on innovative finance mechanisms will be devoted to providing loans to MSMEs through intermediary financial institutions (IFIs) that are accredited by the Central American Bank for Economic Integration (CABEI). This component will involve 21 IFIs and aims to disburse 5,000 credits, expecting to reach 17,000 direct beneficiaries and 50,000 indirect beneficiaries.

4. The second component is related to capacity-building and will have three subcomponents. The first is devoted to generating local capacity on adaptation to climate change and will ensure that both IFIs and MSMEs will have the capacity to understand climate change and identify, assess and develop projects, in line with the operational guidelines of the programme. The second will provide technical assistance to IFIs and MSMEs for the design phase of subprojects' and the implementation and monitoring phase. The third subcomponent will reinforce knowledge management through events and the promotion and dissemination of lessons learned.

5. The third component will provide adaptation incentives, or Adapt Awards, for MSMEs that are able to show impact results in conservation and climate change as well as for IFIs that decide to adopt credit mechanisms that will enhance adaptation measures.

6. The fourth component will be devoted to programme management with the creation of a Programme Management Unit that will involve three full-time positions devoted to ensuring that all components and activities are carried out to achieve the expected impacts.

7. There are very few lending schemes in the world and in Latin America devoted to climate change, specially for MSMEs devoted to the agricultural sector. Most of the lending schemes are not providing the necessary technical capacity-building to support borrowers in the efficient development of alternatives that will eventually allow them to adapt to climate change. Shifting from conventional credit lines to financial plus technical support options climate change adaptation will allow MSMEs to sustain their agricultural models in the medium and long term, proving a paradigm shift in the way agricultural lending schemes are supporting rural economies.

8. Moreover, there is potential for replication and for knowledge-sharing, as the project puts special emphasis on capacity-building by rewarding effective models and by sharing knowledge.

9. The project will provide 5,000 loans in seven countries and across vast geographical areas. In terms of ecosystem-based adaptation the aggregated impacts could therefore be minor in each of the countries. The independent Technical Advisory Panel (TAP) considers that it is important to concentrate loans in areas that could potentially have more borrowers who are able to work together to facilitate the adaptation of ecosystems in a more effective manner.

10. However, monitoring and learning from successful adaptation models in prioritized subsectors will have the potential to be scaled up and eventually have aggregated impacts such as soil conservation, water efficiency, restoration of land hectares and diversification of production.

1.2 Paradigm shift potential *Scale*: N/A

Innovation

11. The innovation is grounded in developing loans that are attached to capacity-building schemes that will support MSMEs to adapt to climate change. Even though microlending schemes are well developed in Central America, there are very few financial schemes devoted to supporting climate change adaptation.

12. Therefore, the idea to pioneer a financial and technical scheme that could be scalable, with an emphasis on knowledge-sharing, is particularly appreciated.

13. The project will include an incentive scheme to promote the implementation of ecosystem-based adaptation by MSMEs, called the Adapt Awards. With this modality the MSMEs and the IFIs could claim refund of a percentage of the loan if they have successfully implemented adaptation measures. Special consideration will be given to women-led enterprises. The following table presents the amount awarded to MSMEs and IFIs and the special incentive given to women-led enterprises.

Percentage of the credit granted			
	MSMEs	**Cooperative, Micro-Finance and Non-Bank institutions (CMNFI)**	**Total**
Women-led	15%	5%	20%
Men-led	8%	4%	12%

14. The refund must be used by MSMEs to further extend the reach of its investment and will allow the IFIs to promote changes within their structures and organization. The maximum amount granted will be USD 10,000 per loan.

15. The programme will also place a strong emphasis on technical assistance by partnering with institutions in Central America that are able to support climate change interventions. The technical assistance providers will be selected from specialized institutions in Central America that already have partnerships with CABEI, such as the Food and Agriculture Organization, Tropical Agricultural Research and Higher Education Centre (CATIE), United Nations Environment Programme, Swedish International Development Cooperation Agency, and Inter-American Institute for Cooperation on Agriculture, among others. The idea is to provide quality and technical assistance to ensure the transfer of technical capacity on climate change both to IFIs and MSMEs.

16. Both the Adapt Awards and technical assistance activities are proposed as transitional tools to incentivize the setting up of long-term adaptation credit facilities in the seven countries. These two instruments will support the establishment of the facility, building the capacity of IFIs and MSMEs but also assuming that they will no longer be necessary after five years of implementation.

Potential for knowledge and learning

17. The funding proposal places special emphasis on knowledge and learning. The proposed activities aim to develop the capacities of IFIs to promote, analyse and finance adaptation investments. The activities will also involve capacity-building for MSMEs, enabling them to gain knowledge and acquire techniques and methodologies to adapt to climate change.

18. The capacity-building scheme will have two stages: one dedicated to the transfer of knowledge on adaptation to both IFIs and MSMEs, and the second to support IFIs and MSMEs during project implementation. This approach, in the view of independent TAP, is very important, as it will allow the programme to achieve climate change impacts and learning.

19. To develop this component, the programme will have a dedicated officer for capacity-building who will establish and develop all the technical services needed to support the programme with technical assistance providers.

20. There will be three critical activities to support programme start-up and to ensure capacity-building throughout the programme. The first activity is an initial workshop in CABEI headquarters in Tegucigalpa to be attended by IFIs, representatives of MSMEs and technical assistance providers, to establish the execution and implementation mechanisms and to introduce knowledge on climate change adaptation.

21. The second activity is the development of start-up workshops for IFIs with the support of technical assistance providers, including the transfer of further knowledge on climate change, as well as providing examples of how and what to finance to accomplish climate change adaptation. Each IFI will have a workshop at the beginning of the programme and in years two and three to support further implementation activities.

22. The third activity will be to deliver start-up workshops for MSMEs to provide them with basic knowledge about climate change threats and technological opportunities to adapt and be more resilient to climate change. Additionally, they will understand the financial requirements and their incentives in terms of technical assistance and rewards. Attendance at this workshop will be required for all MSMEs intending to apply for a loan. To reach 5,000 MSMEs, around 140 workshops will be delivered, with 35 to 40 MSMEs attending each. The estimated distribution during years one to five would be 35 workshops in years one to three, and 28 and seven workshops in years four and five, respectively, organized in selected subregions in each country.

23. There will also be technical assistance support for pre-investment activities at the design phase and for project implementation and monitoring. Financial support will be provided to IFIs to support their capacities to run the programme in climate change and financial aspects and for MSMEs to strengthen capacities on investments oriented to:

(a) Ecosystem and agricultural production system adaptation to climate change;

(b) Removing financial obstacles for these sectors;

(c) Enhancing technical and entrepreneurial capacities; and

(d) Enhancing gender-sensitive investments.

24. To identify the lessons learned, generate and disseminate knowledge, several mechanisms are proposed to feed the project's monitoring, evaluation and generation of lessons

learned. The project will identify at least three innovative practices that could provide lessons learned and could be replicated through dissemination to other MSMEs. There will also be evaluations from the beneficiaries to ensure systematization of innovative experiences and the creation of an exchange network of experiences and practices.

25. This component will also involve the generation of a web platform for the IFI network to allow exchange of experiences including videos and materials, and to provide all relevant information on the management of credit. A study is also proposed to characterize main production sectors and adaptation to climate change with a special emphasis on the involvement of women and young people.

26. The project will design three workshops for dissemination of successful experiences, seven participatory workshops halfway through the programme, two meetings for the exchange of experiences for IFIs and MSMEs including visits to successful projects, and two workshops to analyse the participation of women and young people to ensure that there is opportunity to support them.

Contribution to the creation of an enabling environment

27. The project will create an enabling environment to deploy financial services focusing on climate change adaptation. The project will enable IFIs to understand climate change that will hopefully become an integral and common practice in their financial schemes.

28. If adequately implemented, the credit lines could be scaled to incorporate additional MSMEs and to support rural development and climate change in the seven selected countries.

29. On proven success of the scheme it will be feasible to devote more resources to reach more clients and eventually support the adaptive capacity of MSMEs to cope with climate change risks.

Contribution to the regulatory framework and policies

30. CABEI could have great influence in the way financial entities are mainstreaming climate change in each of the selected countries and could contribute to supporting change in the regulatory framework of financial institutions to support climate change adaptation.

Scalability and replicability

31. The project has enormous potential for scalability and replicability, as it offers a range of measures necessary to build the capacity of IFIs and selected beneficiaries as well as procedures that will assist in understanding how investments can be climate change driven and support the economic development of the MSMEs in Central America.

32. Moreover, the project is making a link between banks and specialized entities that have scientific and technical capacities to support climate change interventions, thus creating a framework to combine financial and climate change capacities to deliver a programme that represents a pioneer effort in the agricultural sector.

1.3 Sustainable development potential *Scale*: N/A

Environmental co-benefits

33. The programme could have several potential environmental benefits, including the conservation of ecosystem services to sustain the activities of the MSMEs. Depending on the characteristics of the projects financed, several potential environmental benefits could occur including restoration of degraded soils, water conservation, improvement in the use of fertilizers, seed conservation, flood control, increase in agroforestry and silvo-pastoral systems and an increase in biodiversity.

34. However, since most of the interventions will be dispersed in different geographic locations, aggregated impacts at the landscape level will not be relevant. Therefore, where possible, loans should be made within similar geographic locations to ensure ecosystem benefits.

Economic co-benefits

35. The most important social co-benefits reside in supporting MSMEs to cope with climate change in such a way that will result in long-term economic benefits. Climate change scenarios for the region suggest that agricultural production could drop significantly with consequences for producers, most of whom operate as family businesses at subsistence levels. This will in turn impact food security and increase poverty levels.

36. Agricultural MSMEs will need to invest initial resources to cope with climate change. According to the project proposal, credit to the agricultural sector accounts for roughly three per cent of total credit offered by regulated financial institutions. The private sector also considers the agricultural sector to be high risk. Therefore, offering loans with conservative interest rates to MSMEs will allow them to improve their businesses and reduce their climate risks. Moreover, doing so with technical assistance that will support smart adaptive investments will ensure efficiency and effectiveness in the use of financial resources.

Social co-benefits

37. The Central American region has high levels of rural poverty, with an average estimate of 33.5 per cent of rural poor and increased levels of migration. The programme will allow MSMEs, mostly operating at subsistence levels, to reduce their climate risks and improve their income levels. It will also support livelihoods and improve food security.

38. The project will also support technical knowledge to selected beneficiaries and will support exchange platforms that could have additional social benefits, by promoting participatory processes, knowledge-sharing and the ability to support each other, creating a stronger agricultural community.

39. Depending on the selected projects, additional benefits could include water provision, improvement of health conditions by reducing the use of fertilizers and pesticides, and better living conditions by reducing the risks of droughts and floods.

Gender-sensitive development

40. CABEI has a gender equality policy that establishes guidelines to promote equality and to empower women through the implementation of a gender perspective in its operations. In line with the above, the project presents a well-designed gender action plan (GAP), which seeks to make women main actors in enhancing climate change adaptation.

41. In this context, the project will give priority to women-led institutions and improve access to credit for women by providing higher percentages of Adapt Awards to MSME projects led by women. It will also ensure that the technical assistance programme reaches women and youth.

42. One of the aims of the project is that gender perspectives will be mainstreamed by IFIs in their loan facilities for this programme and that women-led enterprises and projects will continue to be supported by them.

1.4 Needs of the recipient *Scale*: N/A

Vulnerability of the country and vulnerable groups

43. In 2015 the population of Central America (without Belize) was 44.1 million (World Population Review) and the Dominican Republic population was projected to reach 10.8 million in 2017 (World Population Review). The seven countries involved in the programme have high levels of poverty and the common characteristic of higher poverty rates in rural areas. According to the project proposal, in 2011 approximately 41 per cent of the regional population was below the poverty line, with Honduras (67.6 per cent) and Guatemala (53.7 per cent) featuring the highest percentages. Of the total regional population, 6,8 per cent are classified as living in conditions of extreme poverty, with the highest rate found in Honduras (43.9 per cent). Some of the greatest contrasts are found in Nicaragua, where poverty in urban areas is 26.8 per cent, compared to 63.3 per cent in rural areas, and in Guatemala where urban poverty affects 42.1 per cent of the population, rising to 76.1 per cent in rural areas.

44. Central America is also exposed to the consequences of climate change and because of its location it is frequently hit by droughts, hurricanes and the effects of the El Niño Southern Oscillation. Climate change is increasing social and economic vulnerability, especially for those communities that are dependent on agriculture to support their livelihoods.

45. Changes in streamflow and water availability have been observed and are projected to continue in the future, affecting already vulnerable regions. Water precipitation reduction will affect water supply for agricultural productivity. It will also affect health and income-generation activities such as tourism.

The need for strengthening institutions and implementation capacity

46. The financial sector in general, but mostly the financial and non-financial intermediaries that deal with MSMEs in the selected countries, have little experience in developing lending facilities related to climate change and the environment in general. The deficit in financial options to support rural communities cope with climate change is evident. There is a great need to support and strengthen the capacities of IFIs to understand climate change and develop lending schemes to support their borrowers. Moreover, countries need to provide better incentives to the rural MSMEs to alleviate the levels of rural poverty and support the agricultural sector. The project could demonstrate that targeted financial and technical interventions in support of agricultural MSMEs are effective and make recommendations that would assist the governments to support this type of project in a more systemic manner.

Absence of alternative sources of financing

47. The project presents a market overview section highlighting that the agricultural sector accounts for only three per cent of total credit offered by regulated financial systems in the Central American region. Moreover, the IFIs devoted to serving the rural sector do not have long-term financial instruments, methodologies or human capacity to undertake specialized services providing financial products tailored to sustainable development or climate change requirements. They are also wary of the higher risks in serving rural areas.

48. There is a need to promote financial services to serve micro-, small- and medium-sized enterprises, removing barriers and putting in place incentives.

Need for strengthening institutions and implementation capacity

49. The IFIs that will be involved in the project have limited experience of financial schemes supporting adaptation projects. The project will develop a strong component to strengthen and support the capacities of IFIs to deliver financial and non-financial services for the installation and expansion of adaptation technologies and to encourage MSMEs to take loans in favour of their own adaptive capacity and growth.

1.5 Country ownership *Scale*: N/A

Alignment with national climate strategy

50. The credit line will be available in seven Central American countries, all suffering from the impacts of climate change. Each country has different climate change laws and strategies aligned with the project's objectives:

(a) Guatemala has a Law on Climate Change, enacted on 9 September 2013, which stresses the need for an action plan for adaptation and mitigation in the face of climate change, expressly stating that one of the adaptive measures or actions should be implementing financial tools to help comply with adaptive actions or biodiversity conservation;

(b) El Salvador has a National Climate Change Plan, outputs 2, 3 and 4 of which are directly aligned with the objectives of this programme: protection of public finances and reduction of loss and damage associated with the adverse effects of climate change; biodiversity and ecosystem management for the adaptation to and mitigation of climate change; and transformation and diversification of agricultural, forestry and agroforestry practices and activities;

(c) Honduras has a Law and Action Plan for Adaptation to Climate Change. The Republic of Honduras deems adaptation to climate change a top priority to reduce the country's vulnerability;

(d) Nicaragua has a National Environmental Climate Change Strategy, which is spearheaded by the Ministry of Environment and Natural Resources and constitutes the general framework for adaptation to climate change. In addition, the country has a plan for adaptation to climate variability and change in the agricultural, forestry and fishing sectors with a 20-year horizon;

(e) Costa Rica has a National Climate Change Strategy Action Plan with the objectives of promoting sustainable development through economic growth, social progress and environmental protection via initiatives of mitigation and adaptive action. These aims include enhancement of the adaptive capacity of communities and ecosystems most vulnerable to the impacts of climate change on water resources and reduction of the vulnerability of women and men who are agricultural producers in the face of climate change impacts; and

(f) The Dominican Republic has a National Strategy for Adaptation to Climate Change in the agricultural sector for the period 2014 to 2020 with policies and adaptation measures that support food security of the population and promote low carbon development.

51. All these countries have also committed their nationally determined contributions under the Paris Agreement.

Capacity of accredited entities and executing entities to deliver

52. CABEI is a multilateral bank for the development of Central America. The mission of CABEI is to promote the economic integration and the balanced economic and social development of its founding member countries, attending to and aligning with the interests of all its member countries. CABEI supports public and private development projects that generate jobs, contribute to improving its member countries productivity and competitiveness, and contribute to increasing the region's human development indicators.

53. CABEI has supported the Central American MSME sector, by increasing access to its credit lines through intermediate financial institutions. CABEI experience in financial intermediation has resulted in positive and tangible results. As of June 2016,

722,341 businesses employing 1,350,918 people have received support, boosting employment and growth.

54. CABEI developed a facility named Mercados Centroamericanos para la Biodiversidad (CAMBio), a regional programme on biodiversity markets that supports biodiversity investment through MSMEs, providing the necessary experience to implement the current proposal.

55. A total of 27 IFIs have participated, having disbursed more than USD 58 million. The majority of the participating IFIs corresponded to non-banking institutions. CAMBio has granted 12,107 loans to date, reaching a total of 26,036 beneficiaries, the majority being granted to small businesses.

56. Having learned from CAMBio, and with a long history of effective financial intermediation, CABEI is well positioned to develop CAMBio II. The entity has designed the current programme with the intention of involving partners that understand climate change as its technical assistance providers. Their support will be essential to ensure that climate change is mainstreamed in the programme, and that both IFIs and MSMEs deliver their projects in an effective manner.

Engagement with civil society organizations and other relevant stakeholders

57. The design of the programme involved consultations with CAMBio beneficiaries including eight MSMEs, one IFI and two technical assistance providers. They were asked general questions related to their climate change needs and the functioning of their organization in that regard.

58. In parallel, CABEI carried out consultations on vulnerability to climate change, barriers for access to credit, and the requirements of a potential new initiative focused on adaptation measures, with different actors participating in some of their organized workshops.

59. During the second semester of 2017, meetings with relevant stakeholders were undertaken to inform them about the programme and to gather their opinions as regards design of the current proposal. In total, 11 IFIs, 13 MSMEs and three non-governmental organizations were consulted. Meetings with the national designated authorities of the seven countries were also held with the objective of sharing the stages of this process and to confirm alignment of the programme objectives with the national climate change strategies and commitments. Meetings and conference calls were held with 13 private and public banks and with 21 MSMEs of different scales.

60. Only two technical assistance providers were consulted, from Nicaragua and El Salvador. There is a need to develop further consultations with relevant providers and to make the necessary arrangements to bring them on board by soliciting their suggestions and approach to developing operational manuals, workshops and technical assistance with an appropriate climate change focus.

1.6 Efficiency and effectiveness *Scale*: N/A

Cost-effectiveness and efficiency

61. CABEI is requesting a GCF contribution of USD 12.5 million for the establishment of a risk sharing facility in which CABEI would match GCF funds, making available USD 25 million to provide credits to MSMEs through intermediation under Component 1. Under the proposed structure of a risk sharing facility, CABEI and GCF take shared risk for the IFIs.

62. CABEI is also requesting a USD three million grant distributed as follows: USD 1.84 million for capacity-building activities; USD 0.29 million for advocacy and knowledge

management; USD 0.73 million for Adapt-Awards; and USD 0.14 million for programme management costs (0.91 per cent of GCF proceeds).

63. The distribution of resources is considered cost-effective as most of the resources will be directed to credits and only 7.9 per cent to technical assistance. It is important to emphasize that the technical assistance component is well designed and will be a crucial component to ensure that the project is effectively climate-driven.

64. Both CABEI and GCF will be responsible for their portion of loans to IFIs, but CABEI will be still be bound by accreditation master agreement obligations and thus shall protect the GCF interest amounts. The IFIs will bear a full recourse liability to CABEI/GCF even if MSMEs default on their loans from the IFIs. CABEI and GCF shall have pari passu exposure to IFIs in terms of seniority and tenor. CABEI will reflow principal and interest of the GCF loan portion to GCF. The revolving nature of the credit lines to the IFIs will only apply to the principal amounts repaid by the IFIs. CABEI will also perform all the duties of the accredited entity.

65. CABEI guarantees that GCF concessionality will be passed on to final beneficiaries through the IFIs. CABEI will seek to leverage funds from IFIs and from MSMEs.

66. With the proposed risk facility, CABEI and GCF will be engaging their resources over almost 20 years, and it is expected to have stability, good performance and sustainability over time. The first five years will generate demand and capacities through technical assistance, knowledge-sharing and Adapt Awards. The project will therefore envisage a long-term financial scheme to support adaptation to climate change within rural MSMEs.

II. Overall remarks from the independent Technical Advisory Panel

67. The independent TAP recommends that the Board approves the project subject to the following condition:

(a) Prior to the first disbursement under the FAA, the Accredited Entity shall provide and deliver the following operations manuals, in form and substance satisfactory to the GCF Secretariat:

(i) An Operations Manual for the Risk-Sharing Facility under Component 1;

(ii) An Operations Manual for the Technical Assistance under Component 2; and

(iii) An Operations Manual for the Adapt Awards under Component 3;

containing details of implementation of the Programme and eligibility criteria for the selection of sub-projects, including inputs from the selected Technical Assistance Service Providers (TASPs).

Independent Technical Advisory Panel's review of FP098

Proposal name:	DBSA Climate Finance Facility
Accredited entity:	Development Bank of Southern Africa (DBSA)
Project/programme size:	Medium

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: High*

1. This funding proposal is for a medium-size programme submitted by the direct access entity from Southern Africa. The funding proposal has a programmatic approach and expects to cover GCF result areas for mitigation (70 per cent of investment): energy access and power generation; building, cities, industries and appliances. It also covers result areas for adaptation (30 per cent of investment): most vulnerable people and communities; health and well-being; and food and water security.

2. The Development Bank of Southern Africa (DBSA) climate finance facility programme (CFF) is designed to address constraints in the climate technology market, play a role as a catalyst using a blended finance approach, and contribute to increase climate-related investment in the Southern African region. The programme aims to provide credit enhancements in the form of subordinated debt/first loss guarantees and tenor extension for projects. The total programme loan financing is USD 170.55 million, which consists of: USD 55.61 million from GCF, consisting of USD 55 million in loans on concessional terms to enable CFF to provide affordable long-term financing with a blended finance approach, and a USD 0.61 million grant. DBSA will provide USD 55.61 million co-financing (USD 55 million in loans and USD 0.6 million grant) and the remaining USD 59 million is expected to be funded by other investors such as the Public Investment Corporation (PIC, the largest pension fund in Africa) and Agence Française de Développement (AFD), both of which have indicated strong interest in the programme.

3. CFF will be modelled on the Green Bank concept, as a blended debt facility with a mandate to enhance the credit line for climate friendly projects. The funding proposal highlights that CFF will not fund projects that could be funded solely by commercial banks. Projects will be required to demonstrate that they are focused on technically and economically feasible transactions where there is market interest but limited capital availability due to specific financing gaps and barriers. The focus at this stage is on the key mitigation and adaptation sectors of low-carbon energy generation and energy efficiency, waste to energy, and water supply efficiency.

4. Four Southern African countries – Lesotho, Namibia, South Africa and Swaziland in the ZAR (South African Rand) region – are considered by the funding proposal, with a particular focus on South Africa considering the market and technology barriers that are typical for these economies.

5. Two components are considered in the funding proposal: project management, including operationalization of the DBSA CFF programme, and delivery of outreach programmes to key stakeholders (local private banks, project developers and sponsors) explaining GCF targets and objectives, value proposition, role and capacities of the CFF programme, and the project implementation component.

6. **Component 1** is dedicated to project management, including the operationalization and launch of the CFF unit within DBSA using the project management costs funding from both GCF and Convergence, the global network for blended finance. This component has a strong capacity-building process including: integration of climate change related sectoral eligibility criteria and GCF investment criteria as well as greenhouse gas (GHG) monitoring methodologies for different technologies in the CFF operational manual; conducting intensive on-the-job training of DBSA staff dedicated to CFF, including management and decision-makers, in risk management related to the implementation of climate-friendly mitigation and adaptation technologies. To support development in the early stages and launch of the CFF programme, DBSA has formed a partnership with the Coalition for Green Capital based on their unique and proven capacity to support the formation of Green Banks with governmental and civil society partners, and provide ongoing consulting and guidance to operating Green Banks. Outreach programmes for awareness-raising will be provided to the local banks and other stakeholders that are considered to be partners in the generation and implementation of projects along with the CFF unit dedicated to the same activity. This component uses 0.9 per cent of total budget with a 39 per cent share from GCF.

7. **Component 2** is dedicated to the implementation of mitigation and adaptation projects and will begin after the operationalization of CFF (component 1). The share of this component in total project costs is 99.1 per cent with 33 per cent (USD 55 million) from GCF in the form of a subordinated loan for 15 years (DBSA loans to projects will be in the local currency – ZAR).

8. Planned GHG reduction is 2,373,963 tonnes of carbon dioxide (tCO_2) annually and the number of small, medium and large low-emission power suppliers will increase by 260 and the installed capacity by 257 megawatts (MW).

9. Expected outcome for adaptation: 10 megalitres (ML)/day water saved through efficiency projects; 40 ML/day treated for reuse; and 50ML/day newly sourced.

10. Taking into consideration that this programme is an initiative of the direct access entity, in the case of success high replicability could be anticipated and therefore the impact is rated as high.

1.2 Paradigm shift potential Scale*: Medium*

11. This project is expected to accelerate an increase in installed renewable photovoltaic (PV) energy savings in the commercial and industrial sectors, and the use of methane generated in the waste sector and improve water supply efficiency as an adaptive measure to combat climate change related water deficit, through crowding-in private sector capital in the local market of climate change activities. The programme also planned to tackle the transport sector, but more specific visions are not provided at this stage in the funding proposal. All these activities could lead to transformational changes at a project level while country-wide transformational changes depend on early results and acceleration of their scalability and replicability at later stages.

12. Depending on which sectors prove to be most successful in implementation (e.g. PV or transport) different levels of paradigm shift could be reached. Success of the programme would provide a high degree of transformation in two activities in particular: the transport sector, which is the most costly and also high risk due to barriers, but with high potential for GHG reduction; and increasing the trend of private sector involvement in the financing process for climate change mitigation and adaptation activities. Success in these two directions could immediately lift the scale of paradigm shift from medium to high.

13. The programme is anticipated to have high replicability potential because of the broad involvement of local stakeholders.

14. The DBSA CFF programme should establish a pioneering application of the green bank model adapted to developing countries, which will also contribute to transformational changes in the banking sector of the region considered.

1.3 Sustainable development potential *Scale: High*

15. The programme will contribute to sustainable development goal (SDG) 7 (affordable and clean energy) through installation of 260 MW renewable resources (PV and waste to energy); SDG 9 (industry, innovation and infrastructure) saving 1,723 gigawatt hours (GWh) of energy annually through energy efficiency projects in commercial and industrial sectors; SDG 13 (climate action); SDG 12 (responsible consumption and production) through projects that will help ensure greater efficiency in water use and economic savings through the use of alternative water.

16. The eligibility of participants and beneficiaries is almost unlimited and is inclusive of gender, geographic area, vulnerability and scope, providing a good basis to demonstrate the high sustainable development potential of the programme.

1.4 Needs of the recipient *Scale: High*

17. The needs of countries regarding GHG mitigation and climate change adaptation are analysed in the funding proposal. The following should be highlighted:

(a) Currently 94 per cent of South Africa's electricity is generated from coal and over 30 per cent of gasoline and diesel needs are supplied by liquefied coal; such over-dependence on coal presents a fundamental challenge to reducing GHG emissions;

(b) The energy intensity of the South African economy has resulted in an emissions profile that substantially higher than that of other developing countries at a similar stage of development. Energy demand is forecast to double from roughly 44 GW to 80 GW by 2025 and best-case scenarios based on current policy anticipates that only about 42 per cent (18 GW) of the required newly installed capacity will be provided by renewables; and

(c) South Africa is ranked as the thirtieth driest country in the world. It is a highly water-stressed country with extreme climate and rainfall fluctuations (World Resources Institute, 2015). Despite being a water-scarce country, consumption is around 233 litres/capita/day (l/c/d), compared to the international benchmark of around 180 l/c/d (DWS, 2017).

18. Based on extensive consultations conducted by DBSA with the major commercial banks that have operations in all four target countries, the following key barriers for investment in climate-related projects were identified:

19. **Tenor**: tenor extension was seen by the commercial banks as the primary intervention that will unlock investment in climate mitigation and adaptation projects. Regulatory constraints (i.e. Basel III) are the main driver for this barrier, which impacts all four countries. Commercial banks across all the CFF target countries cannot provide tenors for more than 7-8 years as confirmed by stakeholders. The proposed CFF tenor extension of up to 15 years is therefore seen as an essential intervention by the CFF in unlocking this barrier for the targeted sectors;

20. **High interest rates**: high interest rates were also identified as a barrier to investment in climate mitigation and adaptation. With this intervention, projects will be co-funded by CFF and the commercial banks. GCF concessionality would make it possible for the projects to benefit from a favourable blended rate that would be significantly lower than that currently offered in the market (as per the data provided). Based on the envisaged GCF concessionality,

CFF could offer more affordable rates, which, blended with the current commercial bank rates, would be quite competitive in the market; and

21. **Perceived high investment risk** of climate mitigation and adaptation projects. The ability of the CFF to offer subordinated debt/first loss guarantees will help unlock the market.

22. **Technological risks** (maintenance, underperformance, etc.) are not adequately analysed in the funding proposal and should be appropriately focused in the operational manual.

1.5 Country ownership *Scale: High*

23. The DBSA has engaged with a wide range of critical stakeholders to ensure country ownership, including multiple interactions with the South African Department of Environmental Affairs and national designated authority, who have shown interest and indicative support for CFF, and the five major South African commercial banks all of which have indicated support for formation of CFF.

24. The national designated authorities of all four participant countries provided letters of no objection.

1.6 Efficiency and effectiveness *Scale: High*

25. Effectiveness of the programme depends on post-programme sustainability of the activities introduced such as: leveraging of equity and loans by the local stakeholders (private and public) for climate-friendly technologies; establishment of long-term project pipelines by sectors; development status (maturity, high performance, etc.) of climate change related technologies available to the local market after project completion; how long the financial concessionality will be required for implementation of climate-friendly technologies (to be supported by long-term loans and concessional rates that are not clear at this stage). However, there is high probability that raising awareness and building capacity in the local private sector for green economy and climate change will have a significant effect, even if technological progress is not fast. In addition, in a long-term perspective the DBSA plans to convert CFF into a green bank, which also guarantees that the programme will have a high impact.

26. Effectiveness of implementation greatly depends on an executing entity, such as DBSA for this particular project. Based in South Africa, DBSA is a national entity, specifically for development of financial institutions, with a mandate to finance both private and public sector activities at national and regional levels in Africa. DBSA provides sustainable infrastructure project preparation, finance and implementation support to improve the population's quality of life, accelerating the sustainable reduction of poverty and inequity, and promoting broad-based economic growth and regional economic integration. Climate and environmental finance is embedded in the DBSA strategy and the entity has played a key role in the implementation of projects to help South Africa transition to a green economy, including its role as implementing agency for the Green Fund of South Africa and financing the commendable programme for independent power producers. DBSA has great potential to achieve high impact and efficiency subject to the proper operationalization of CFF. Following the operationalization of CFF, during the project implementation stage, DBSA will need time to gain experience in financing the climate change market and reaching a high degree of efficiency.

27. Due to the extremely high solar resource, low installation costs of solar PV and energy efficiency, high leveraging ability and high baseline emissions, the average cost efficiency of the mitigation aspect of this project is very high compared to global standards for funds of this nature. The expected cost of investment per tCO_2 mitigated is USD 5.7. For GCF the cost will be

USD 1.9. Regarding the GHG emission reduction cost, the project has high efficiency as well as high adaptation, financial market and social (employment, improved clean services, etc.) impacts.

28. It is important for the local stakeholders and beneficiaries that money will be lent to the final implementer in local currency and all currency exchange costs will be assumed by GCF.

II. Overall remarks from the independent Technical Advisory Panel

29. The independent Technical Advisory Panel recommends the funding proposal for approval by the Board subject to the following conditions:

(a) Prior to the first disbursement of reimbursable funds by GCF under the funded activity agreement, the AE will deliver a written confirmation, in a form and substance satisfactory to the Secretariat, that an operating unit of CFF has been established within the AE for implementation of the programme, with sufficient capacity to originate, structure, implement and monitor the portfolio of eligible projects in accordance with the operational manual and to ensure that loans are provided to eligible sub-projects; and

(b) Except for the first disbursement, the AE will deliver to GCF, together with the disbursement request, a written confirmation, issued by an authorized officer of the AE, that the subprojects being implemented under the programme are in compliance with the criteria set in the operational manual and it will report the ongoing status of programme implementation.

Independent Technical Advisory Panel's review of FP099

Proposal name:	Climate Investor One
Accredited entity:	Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden N.V. (FMO)
Project/programme size:	Large

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential *Scale: Medium*

1. The funding proposal is a large-scale mitigation proposal for USD 821.5 million with a GCF share of 12 per cent (USD 100 million), invested in the form of reimbursable grant, of which 80 per cent will ultimately be held in the form of junior equity within the Climate Investor One (CIO) structure. The proposal falls in the GCF result area "energy access and power generation". The funding proposal proposes the establishment of a blended finance facility to accelerate the implementation of clean energy projects, shortening the whole cycle by 2–3 years and reducing the implementation costs by 9–10 per cent against the situation at baseline. Initially, the focus will be on delivery of on-grid power from renewable energy sources (wind, solar, geothermal and small hydro).

2. Four executing entities will be involved in implementing the proposal: Nederlandse Financierings-Maatschappij voor Ontwikkelingslanden N.V. (FMO), which is also the accredited entity (AE), the two operational fund components of CIO – the Development Fund (DF) and the Construction Equity Fund (CEF), and the fund manager for CIO, Climate Fund Managers[1] (CFM), which is an equal-joint venture between FMO and Sanlam InfraWorks with both parties holding a 50 per cent equity interest in CFM. CFM will manage the CIO financing facility, which currently comprises two operationally interlinked investment funds (DF and CEF), with a third fund component, the Refinancing Fund (RF) to be raised over the near term. CIO is not a legal entity but a blended finance concept (a "whole-of-life" assurance). The fund components of CIO are as follows:

(a) **Development Fund** (DF): designed to finance the projects' development for its full lifecycle. The DF seeks to find early-stage projects in target markets where finance is scarce at the development stage, or expensive due to the high risk. The DF provides readily available capital for a project developer for the whole implementation cycle and also reduces the complexity of the development phase by providing a loan of up to 50 per cent of the project development costs. The developer is therefore able to focus less on capital raising and more on project development. The main investment goal of the DF is to maintain its capital throughout the lifespan of CIO. At the development stage, projects are provided with multi-dimensional technical assistance including legal, financial, and others;

(b) **Construction Equity Fund** (CEF): designed to finance and expedite the construction phase, the CEF is divided into three different tranches (junior equity, ordinary equity and senior equity) to attract multiple investor classes. The junior equity tranche is populated with donor capital in the form of returnable grants to absorb a higher portion

[1] A first-time fund manager with an experienced team and shareholders.

of risk, acting as the principal enabler to attract commercial capital to the structure by providing a "first loss" buffer to the CEF and a low cost of capital. The ordinary equity tranche targets commercial investors seeking commercial returns, at an acceptable risk profile. This tranche is supported by the low cost of capital and the first loss position of the junior tranche and affords a hurdle rate to investors in successful projects. Only after ordinary equity investors are paid will junior equity investors receive their capital plus return. The senior equity tranche provides investors a guaranteed return on the back of an Export Credit Agency guarantee. This tranche is designed for investors with no or minimal prior investment track record in developing markets, who will invest in CIO with a more risk averse position than investors in the ordinary equity tranche. It is estimated that for a Construction Equity Fund of USD 775 million, a development fund of USD 46.5 million is required, which leads to the total project cost of USD 821.5 million; and

(c) **Refinancing Fund** (RF): designed to provide the project company post construction debt finance, removing the need for complicated (and time consuming) multi-party lending structures during the construction phase. RF will comprise a combination of local and international lenders seeking to provide debt to well-structured and fully operating assets with stable cash flows. RF is able to provide up to approximately 49 per cent of the refinancing costs for individual projects. This fund is not being raised at the moment and capital raising will begin when a number of projects reach the construction stage.[2]

3. The Programme covers 11 participant countries: Burundi, Cameroon, Djibouti, Indonesia, Kenya, Madagascar, Malawi, Mongolia, Morocco, Nigeria, and Uganda. The list of indicative projects for each participant country is provided in section E.1 of the funding proposal. Two or three projects are expected to be implemented per country, installing around 1,620 MW capacity in total during the lifetime of technologies. Of this total, 1,300 MW will be realized through GCF and catalysed financing. At the initial stage the programme will be limited to projects generating on-grid power from renewable energy sources.

4. Since the potential impact of CIO depends on the current state of the country's electricity sector it is expected that, due to their low electrification rates, the sub-Saharan African countries will benefit mostly in terms of people served by electricity, while Morocco, Nigeria, and Uganda will benefit greatly in the avoidance of greenhouse gas (GHG). Although all the targeted countries have a geographical advantage for renewable technologies, some will benefit exceptionally in terms of electricity production due to their abundance of renewable resources, such as Morocco (solar and wind) and Djibouti (wind).

5. The overall project impact assessed in the funding proposal is based on the key characteristics of the existing pipeline of indicative projects. Total electricity generated from renewable sources is expected to be 87,160 GWh over the lifetime of technologies. The annual reduction of GHG is estimated taking into consideration the grid emissions factor of each country and the average lifetime of installed renewable energy technologies. It is anticipated that the programme will lead to a reduction of about 53.7 million tonnes of carbon dioxide (tCO_2) during its lifespan, plus technology lifetime after the programme completion. It is estimated that CIO will reach 8.2 million people, about 2 per cent of the total population of participant countries.

[2] According to the funding proposal, the have received a letter of interest from FMO stating a soft commitment for an investment of USD 25 million in the CIO Refinancing Fund as well as an expression of interest from a large global insurance company investor.

6. Impact of the funding proposal is anticipated to be "medium" because it is not designed to bring significant transformational changes that will be easily visible, rather it is planned to work in a relevant sector that is already developed but remains complex and faces significant barriers. The key achievement of the programme should be acceleration of an increased share of renewables in the power sector of participant countries. The target sector and activity offered are very important but are crowded by GCF and other similar programmes, which could present a barrier to correctly estimating and monitoring the acceleration rate of the process. In response to the concern of the independent Technical Advisory Panel (TAP) expressed in this regard, the AE developed a methodology for monitoring the acceleration of processes against the situation at baseline.

1.2 Paradigm shift potential *Scale: Medium*

7. The programme cannot be considered as an activity that will bring a high-level paradigm shift in the renewable power sector but it has added value in ongoing global processes that assist the participant countries in implementation of their nationally determined contribution (NDC) commitments.

8. The main focus of the funding proposal is on an innovative investment scheme enabling new investors, with no or minimal track record in developing markets, to enter a new business previously considered as high risk, accelerating the development and implementation of projects and reducing costs across the entire process.

9. CIO provides different types of technical support to the private sector at the development stage, provides ready investment for the construction phase and reinvestment finance at the operational stage, all of which are fundamental elements of the investment scheme and might be considered innovative for these countries.

10. Replicability of the investment scheme depends on its success and final results. The participant countries have different economic and social statuses, different renewable resources and energy policies and consequently some countries may enjoy greater benefit and success than others. Depending on the results of this experience the scheme could be adapted to different regions.

1.3 Sustainable development potential *Scale: High*

11. The funding proposal contributes to different Sustainable Development Goals (SDGs), such as:

(a) SDG 8.3: promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services;

(b) SDG 7: ensure access to affordable, reliable, sustainable and modern energy for all;

(c) SDG 8.4: improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead; and

(d) SDG 8.10: strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all.

12. The AE estimated that in total 26,460 jobs will be created during the lifetime of all technologies.

13. It is anticipated that the programme will also contribute to the reduction of the deforestation process as most of the CIO target populations use fuel wood for cooking and heating.

1.4 Needs of the recipient *Scale: High*

14. Common needs of the recipient countries are mainly related to market financing conditions affecting their energy generation and generation from renewable sources in particular. Among several barriers to development of renewable energy projects, three are specifically targeted by the CIO: slow project implementation timelines; high cost of capital; and limited exit/refinancing options for investors. In confidential part of the funding proposal the accredited entity provides example demonstrating cost savings for particular case. These savings are related to the removal of specific project finance costs (e.g. debt service reserve accounts, interest during construction and timelines);

15. The individual needs and commitments of the receipient countries for increasing the share of renewables in energy generation are considered, based on their NDCs:

(a) According to its NDC, Burundi plans to contribute to the mitigation process through installation of three hydropower stations;

(b) Cameroon plans to achieve a renewable share of 25 per cent in the electricity grid. To reach this target the mitigation measures for the power sector consist of the installation of 11 per cent micro-hydropower, 7 per cent biomass power, 6 per cent solar and 1 per cent wind power;

(c) The NDC of Djibouti considers installation of 60 MW onshore wind turbines, three solar power plants with an estimated photovoltaic potential of 250 MW and a 1,200 MW geothermal power plant;

(d) The NDC for Kenya states that an expansion in geothermal, solar and wind energy production is the first priority along with other renewables and clean energy options. The NDC does not specify further the capacities to be installed;

(e) Madagascar has committed to facilitate access to energy by strengthening existing systems and by promoting renewable and alternative energies. The country plans to increase the renewable energy (hydro and solar) share from an existing 35 per cent to 79 per cent;

(f) The current electricity generation capacity of Malawi is only 351 MW against an estimated suppressed demand of 400 MW. Access to grid electricity is, at just 10 per cent, one of the lowest in the world. Malawi's electricity generation deficit is not only a hindrance to new investments in manufacturing, industry, mining and tourism but also detrimental to the social and economic well-being of its people. Thus, investments that would enhance the generation, transmission, distribution and utilization of alternative and renewable energy sources are key to development in Malawi;

(g) The mitigation strategy of Mongolia considers an increase of renewable electricity capacity to 30 per cent of total electricity generation capacity by 2030. Under the specific measures Mongolia considers installation of 354 MW wind power and 145 MW solar power;

(h) The NDC of Morocco states that the total cost to reach its goal (527 million tonnes of carbon dioxide equivalent ($MtCO_2eq$) between 2020 and 2030) is USD 50 billion. USD 24

billion of the total would be conditional on international support available through new climate finance mechanisms, including GCF. The country's national energy strategy for mitigation aims to provide 52 per cent of the installed electrical power from renewable sources, of which 20 per cent from solar energy, 20 per cent from wind energy and 12 per cent from hydraulic energy, by 2030;

(i) The NDC of Nigeria commits to 20 per cent unconditional and 45 per cent conditional GHG mitigation from a business-as-usual scenario. In order to reach this target Nigeria plans mainly to develop off-grid solar energy;

(j) The NDC of Uganda plans to achieve a total of at least 3,200 MW renewable electricity generation capacity by 2030, up from 729 MW in 2013.

16. The indicative list of projects for each participant country, provided in the confidential part of the funding proposal, demonstrates the significant contribution of the programme to the implementation of countries' commitments under the Paris Agreement.

1.5 Country ownership *Scale: Medium*

17. According to the funding proposal the AE had consultations with local representatives from governments and private sectors and a list of the individuals consulted was provided. However, an analysis of this round of consultations and interest expressed by governments or new players from the private sector is not provided.

18. All participant countries provided a no objection letter (NOL).

19. The independent TAP rated this criteria as "medium" because, despite the contribution of CIO activities to the implementation of participant countries' NDCs, it is mainly oriented towards the private sector and an investment scheme, which will bring relatively limited capacity at the local level as neither of these are directly linked to or based on national programmes where ownership from governments is usually higher.

1.6 Efficiency and effectiveness *Scale: Medium*

20. According to the funding proposal, GCF would catalyse USD 845 million of commercial capital for project development and construction over the lifetime of CIO, which could be considered quite efficient from the financial point of view. The cost of reduced emissions for the whole project is USD 15.3 per tCO_2 and for GCF it is USD 1.86 per tCO_2, which is also efficient.

21. However, the independent TAP identified several risk areas of the programme thus leading to an efficiency score of "medium". In particular:

(a) The project development fund provides a loan to the developers, which might be a barrier in countries where various types of grant are available for climate change and preparation for renewable energy projects from international donor organizations. This situation might restrict crowding-in new projects and new developers to programme participation. Instead traditional renewable projects and investors who are already active in the market and offer lower risk for CIO would probably gain priority. In order to avoid such results "senior investors", described in the funding project as investors with no or minimal prior investment track record in developing markets, should be monitored and reported very carefully, and in particular local senior investors. The AE believes that the availability of "whole-of-life" capital will balance this risk, which was considered by the independent TAP as reasonable;

(b) GCF is already financing different projects in the same sector and in the same countries. The funding proposal comprises a table with GCF-financed projects in the participant

countries. The AE will need to monitor closely the implementation of similar GCF-financed projects, assuring complementarity of its activities and avoiding any possible overlap among GCF projects. Results of this monitoring should be part of the AE reports; and

(c) Aside from GCF funding, which will be invested in by the 11 countries foreseen in the funding proposal alongside other donors, CIO is a global asset manager with a mandate to invest in developing countries. A more detailed description of the investment geography of CIO is provided in section A.2 of the funding proposal. A portion of CIO funding from investors other than GCF will be invested in other developing countries. The main objective is to reduce GHG emissions by constructing around 30 projects during the entire programme, of which around 20 projects are expected to be in the GCF participant countries. The independent TAP notes the risk identified by the Secretariat of potential underinvestment in GCF mandate countries in the context of the overall CIO geographical mandate, which should also be closely monitored by the Secretariat.

22. As currently designed, CIO covers only on-grid power generation projects. The AE confirmed that, should new market developments occur, CIO may decide to cover off-grid energy projects as well. Relevant methodologies (including GHG monitoring plans) would accordingly be developed and submitted to GCF for approval prior to initiating activities.

II. Overall remarks from the independent Technical Advisory Panel

23. The independent TAP takes into consideration the importance of timing for implementation of low-emission projects and programmes and recommends this funding proposal for approval by the Board.