



GEF-6 PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project
TYPE OF TRUST FUND: GEF Trust Fund
 information about GEF, visit TheGEF.org

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PART I: PROJECT INFORMATION

Project Title:	Sustainable development of Comoros Islands by promoting the geothermal energy resources		
Country(ies):	Union of Comoros	GEF Project ID: ¹	9040
GEF Agency(ies):	UNDP	GEF Agency Project ID:	5484
Other Executing Partner(s):	Ministry of Production	Submission Date:	27 February 2015
		Re-Submission Date:	27 March 2015
		Re-Submission Date:	6 April 2016
GEF Focal Area(s):	Climate Change	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/> Corporate Program: SGP <input type="checkbox"/>		
Name of parent program:	[if applicable]	Agency Fee (\$)	561,038

A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES²

Objectives/Programs (Focal Areas, Integrated Approach Pilot, Corporate Programs)	Trust Fund	(in \$)	
		GEF Project Financing	Co-financing
CCM-1: Technology Transfer, and Supportive Policies and Strategies Program 2: Develop and demonstrate innovative policy packages and market initiatives to foster new range of mitigation actions	GEFTF	5,905,662	47,500,000
Total Project Cost		5,905,662	47,500,000

B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: To promote geothermal renewable energy resource by supporting the exploratory and drilling phases.						
Project Components	Financing Type ³	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Project Financing	Co-financing
1. Establish policy, regulatory, legislative and financial de-risking instruments for renewable energy development	TA	Streamlined and comprehensive market-oriented energy policy, legal/regulatory framework and financial instruments for renewable energy based power plants	1.1 Policy and legislative package for Renewable Energy (RE) development adopted 1.2 Cornerstone financial de-risking instruments defined, adopted and enforced	GEFTF	1,500,000	4,000,000
2. Upstream geothermal development preparation	Inv	Geothermal resource availability is assessed and well known	2.1 Completed assessment of Comoros geothermal resource potential	GEFTF	3,500,000	40,000,000

¹ Project ID number will be assigned by GEFSEC and to be entered by Agency in subsequent document submissions.

² When completing Table A, refer to the excerpts on [GEF 6 Results Frameworks for GETF, LDCF and SCCF](#).

³ Financing type can be either investment or technical assistance.

			2.2 Exploration drilling completed 2.3 Production drilling wells completed			
3. Public relations and promoting investment	TA	Increased awareness about geothermal potential and investment climate	3.1 Public Relations and investment promotion campaign conducted 3.2 Guidebook on geothermal development in Comoros published	GEFTF	650,000	2,700,000
Subtotal					5,650,000	46,700,000
Project Management Cost (PMC) ⁴				GEFTF	255,662	800,000
Total Project Cost					5,905,662	47,500,000

For multi-trust fund projects, provide the total amount of PMC in Table B, and indicate the split of PMC among the different trust funds here: ()

C. INDICATIVE SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE, IF AVAILABLE

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (\$)
Recipient Government	Ministry of Production	In-kind	2,000,000
Donor Agency	Government of New Zealand	Grants	500,000
Donor Agency	African Union (through GRMF)	Grants	8,000,000
GEF Agency	UNDP	Grants	1,000,000
Donor Agency	African Development Bank	Loans	20,000,000
Donor Agency	World Bank	Loans	5,000,000
Donor Agency	European Union	Grants	1,000,000
Donor Agency	Arab Funds (Qatar and Saudi Arabia)	Grants/Loans	10,000,000
Total Co-financing			47,500,000

D. INDICATIVE TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES) AND THE PROGRAMMING OF FUNDS ^{a)}

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	(in \$)		
					GEF Project Financing (a)	Agency Fee (b) ^{b)}	Total (c)=a+b
UNDP	GEFTF	Union of Comoros	Climate Change	(select as applicable)	5,905,662	561,038	6,466,700
Total GEF Resources					5,905,662	561,038	6,466,700

a) Refer to the [Fee Policy for GEF Partner Agencies](#).

E. PROJECT PREPARATION GRANT (PPG)⁵

Is Project Preparation Grant requested? Yes ☒ No ☐ If no, skip item E.

⁴ For GEF Project Financing up to \$2 million, PMC could be up to 10% of the subtotal; above \$2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

⁵ PPG requested amount is determined by the size of the GEF Project Financing (PF) as follows: Up to \$50k for PF up to \$2m (for MSP); up to \$100k for PF up to \$3m; \$150k for PF up to \$6m; \$200k for PF up to \$10m; and \$300k for PF above \$10m. On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

PPG AMOUNT REQUESTED BY AGENCY(IES), TRUST FUND, COUNTRY(IES) AND THE PROGRAMMING OF FUNDS

Project Preparation Grant amount requested: \$140,000					PPG Agency Fee: 13,300		
GEF Agency	Trust Fund	Country/ Regional/Global	Focal Area	Programming of Funds	(in \$)		
					PPG (a)	Agency Fee ⁶ (b)	Total c = a + b
UNDP	GEFTF	Union of Comoros	Climate Change	(select as applicable)	140,000	13,300	153,300
Total PPG Amount					140,000	13,300	153,300

F. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS⁷

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO _{2e} mitigated (include both direct and indirect)	1,520,100 metric tons

PART II: PROJECT JUSTIFICATION

1. *Project Description.* Briefly describe: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area⁸ strategies, with a brief description of expected outcomes and components of the project, 4) [incremental/additional cost reasoning](#) and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and [co-financing](#); 5) [global environmental benefits](#) (GEFTF) and/or [adaptation benefits](#) (LDCF/SCCF); and 6) innovation, sustainability and potential for scaling up.

1) The global environmental and/or adaptation problems, root causes and barriers that need to be addressed

The Union of Comoros is an archipelago island nation in the Indian Ocean, located at the northern end of the Mozambique Channel off the eastern coast of Africa, between Mozambique and Madagascar. The archipelago is comprised of three main islands: Grande Comore, Moheli and Anjouan; totalling 2,034 km². Its total population is estimated at 800,000 inhabitants (2010). 34% of the population is estimated to live in urban areas. According to the 2014 UNDP Human Development Report (HDR), Comoros is ranked 159th in the Human Development Index, out of 187 assessed countries. The HDR is an independent, empirically grounded analysis of major development issues, trends and policies. Comoros is classified as a Small Island Developing State (SIDS) and a Least Developed Country (LDC).

Status of the Energy Sector

About 46% of the population have access to electricity. This is a national average, which high substantive differences between islands. On Grande Comore, 53.6% of the population have access to electricity, while the proportion on Moheli is 28.4%, and on Anjouan, 22.6%.

The main sources of energy are biomass and fossil fuels. Petroleum products, all imported, account for 41% of the energy balance and are used for transport, electricity production, and household use. Electricity generation is chiefly based on thermal power plants. Biomass, in the form of plants and ligneous biomass, is used mainly for household

⁶ PPG fee percentage follows the percentage of the Agency fee over the GEF Project Financing amount requested.

⁷ Provide those indicator values in this table to the extent applicable to your proposed project. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the [GEF-6 Programming Directions](#), will be aggregated and reported during mid-term and at the conclusion of the replenishment period. There is no need to complete this table for climate adaptation projects financed solely through LDCF and/or SCCF.

⁸ For biodiversity projects, in addition to explaining the project's consistency with the biodiversity focal area strategy, objectives and programs, please also describe which [Aichi Target\(s\)](#) the project will directly contribute to achieving.

cooking needs (75%), ylang-ylang distilleries (19%) and other activities (drying copra, lime carbonisation – 6%). Renewable energies (hydropower, solar PV, geothermal) still occupy a negligible share of the energy matrix.

Energy is one of the main weaknesses of the Comorian economy. The production and distribution of energy are carried out by MA-MWE, a company 100%-owned by the State. There are no Independent Power Producers (IPPs).

The installed capacity is estimated at 22 MW, but only 8 MW is really available. This leads to recurrent power cuts (between 8 and 12 hours per day at Grande Comore). The rate of return is very low and production costs are high. This is mainly due to an outdated and poorly maintained distribution system, resulting in short-term management and significant losses for the power utility. These difficulties (barriers) are compounded by:

- The lack of a strategy and appropriate institutional framework on energy
- Poor and short-term management (low production, loss, fraud, low recovery, etc.)
- The lack of human resources for effective management of the energy sector
- The small size of the market
- Illegal connections, which cause significant losses to the power utility.
- The prohibitive cost of using diesel generators (fuel costs, costs of operation and maintenance)
- Investors' awareness and perception of risks
- Very little development of the private sector

In the near future, MA-MWE plans to develop an 18 MW Heavy Fuel Oil (HFO) based plant, with support from India. Despite the high cost of financing (costly loans), strong opposition from certain actors, and some environmental and security safeguards as the plant site is close to the international airport, the project is underway and laying of the foundation stone has already taken place.

MA-MWE at a glance

- *Owner: 100% by the State (public company).*
 - *Locality: operates in 2 islands: Grande Comore and Moheli. Another state-owned company (EDA) operates in Anjouan.*
 - *Number of agent/staff: 770.*
 - *Installed capacity: 22 MW, but only 8 MW available.*
 - *Electricity generation cost: US\$0.75/kWh.*
 - *Average applied electricity tariffs: US\$0.30/kWh (e.g. heavily subsidized).*
 - *Share of diesel fuel: 93% of the produced electricity (76% of the costs of generation)*
 - *Sales: Only 15% of the production is invoiced; 20% is consumed by the Government, which does not pay; 25% is consumed by fraud; 40% by transmission losses.*
 - *Balance sheet: Systematic deficit: receivables of US\$40 million; debt of US\$45 million; fuel expenses exceeding the amount of sales by 166%.*
-

The Energy sector, main driver for environmental degradation

As described above, the energy sector in Comoros is heavily reliant upon fossil fuel and non-renewable biomass. Electricity generation is essentially petroleum-based. It is acknowledged that fossil fuels are currently the main drivers for greenhouse gas (GHG) emissions. In addition, the use of heavier crude oils results in more emissions and environmental degradation compared to conventional oil.

Comoros is totally dependent on diesel fuel and, in addition, is being pressured to build a new heavy fuel oil plant. These are inappropriate solutions and will only increase environmental and economic risks, and atmospheric pollution. In the Second National Communication (SNC) of Comoros to the UNFCCC, the energy sector is identified as being the third-highest emitting sector after the forestry and agriculture sectors, accounting for 9% of total GHG emissions. But trends show that, under the business as usual scenario, the energy sector will become the largest emitting sector by 2030, representing 48% of total GHG emissions by that time. Trends also show that GHG emissions will eventually fall in the forestry and agriculture sectors, while significantly increasing in the energy sector. The SNC concludes by observing, “emissions in the energy sector are increasing in contrast to the other sectors. This can be explained by a significant increase of the population in urban areas and a slight increase in energy needs in the industrial sector. These trends should alert our policy-makers that they must further develop mitigation measures for the energy sector.” Adoption of renewable energies is one of the mitigation measure identified in the SNC. Geothermal offers the only real near-term solution.

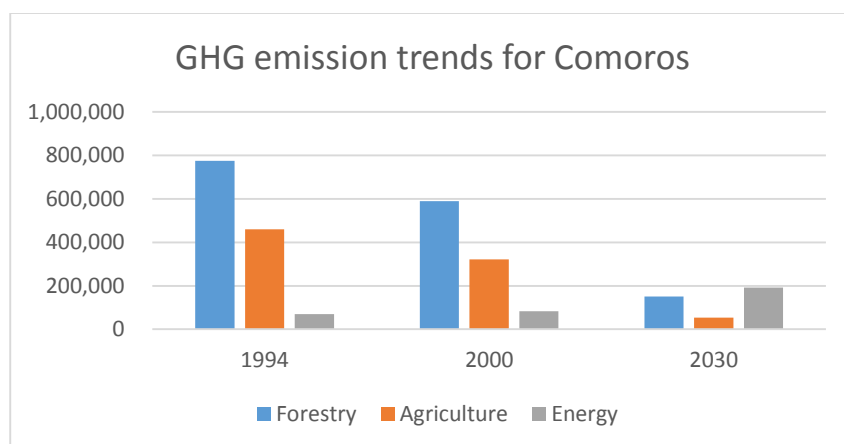


Figure: GHG emission trends for Union of Comoros⁹

Potential of Renewable Energy in the country

The archipelago has a range of renewable energy sources, with different potential for development. Biomass, hydropower, solar, wind and geothermal are available.

- Biomass:

Biomass, in the form of plants and ligneous biomass, is used mainly for household cooking needs (75%), ylang-ylang distilleries (19%) and other activities (drying copra, lime carbonisation – 6%). Total annual production of biomass is estimated to be 96,700 tonnes of oil equivalent (TOE). But biomass is not currently exploited in a sustainable or renewable manner.

- Hydropower:

The country has a limited hydro system. There are no rivers on the island of Grande Comore due to the permeable nature of the soil. The potential of hydropower on Anjouan is estimated at 5 MW, but only a mini power plant of 240 kW is functioning. On Moheli, the potential of hydropower is estimated at 1.5 MW, but only a micro hydro station of 14 kW is functioning.

⁹ Source: Second National Communication to the UNFCCC (2012).

- Solar:

The average sunshine level of the archipelago is 6 kWh/m²/day. This gives a potential of 3,600 GWh per year. But given the configuration of the islands, the solar potential is more suitable for isolated mini-grids rather than large PV or CSP power plants. Currently, there is only 1 solar PV plant (1 MW) running in Anjouan.

- Wind:

There are no proper studies of the wind potential of Comoros. Roughly, it is estimated that wind resources are mid-level, with wind velocity (measured at 50 metres) higher than 5 m/s. The wind speed seems constant and does not vary throughout the year. There is no current exploitation of the wind resource.

- Geothermal:

Early work has suggested that there is a heat source below the Karthala volcano and surrounding areas (in Grande Comore). The key indicator of a potentially exploitable geothermal system is the presence of a rift system associated with the active volcano. This type of rift, similar to that in Hawaii where there is already geothermal exploitation, could host thermal activity at a depth suitable for targeting by drilling. This geological structure, observed surface thermal discharges and an initial geophysical survey undertaken in 2008, suggest that an active geothermal system is present. Further surface exploratory work undertaken in mid-2015 has come to the conclusion that the resource is estimated to have a capacity of approximately 43 MW, with possible indications of a still larger resource. This is more than sufficient for a planned development of 10 MW. As the possible development area is at high elevation, there will be major logistical issues associated with the provision of access roading and a water supply for drilling. This will be further complicated by a high level of volcanic risk. Nevertheless, power development is possible although at higher costs than most geothermal developments.

While the scale of any geothermal development will have a direct impact on costs, as does the productivity of individual wells, it would be reasonable to expect that the basic cost of geothermal generation for a 10 MW plant would be of the order of US\$0.10-0.15 per kWh (compared with the actual US\$0.75/kWh generation cost of MA-MWE). The 10 MW plant could save some US\$ 30 million in fuel costs per year and over 50,000 tonnes of CO₂ emissions per year.

Main barriers to the adoption of renewables in Comoros

As described above, the archipelago has significant potential for renewable energies. But this potential is barely tapped, due to a number of reasons:

- The lack of a strategy and appropriate institutional framework on energy: the current legal framework is a barrier to the development of a renewable energy market in Comoros because there are no specific provisions promoting renewables' use.
- A weakly-managed power utility (limited production, excessive technical and non-technical losses, fraud, low recovery, etc.): there is high electricity demand that the power utility cannot supply. Thus, power cuts occur daily. This leads to poor and short-term management, preventing planning and the development of strategic actions for long-term solutions.
- The small size of the market: Comoros is a small country, with fewer than 1 million inhabitants. This is not a critical size that would easily sustain a high level of demand. Being an island makes it difficult for import/export of electricity that could increase the size of the market.
- An unfavourable investment environment: investors' awareness and perception of risks, and very little development of the private sector – there are currently no private investors involved in the energy sector due to the high risk of investing in Comoros, given that there is no existing legislation covering potential IPP activities.

2) The baseline scenario or any associated baseline projects

A number of initiatives on promoting renewable energy and/or better modern energy management have been initiated in Comoros. In fact, the development of renewable energies alone will not solve/remove the current problem of limited and unreliable electricity supply on the island. Any development has to be complemented by a better management of the energy sector.

Projects	Description
Support to the Energy Sector <i>(Projet d'appui au secteur de l'énergie)</i> Main actor: African Development Bank (AfDB) Budget: USD 20 million Duration: 38 months (2014 – 2017)	<p>Following a technical study conducted by AfDB, it was confirmed that there is a need for urgent actions in the electricity sector in Comoros. AfDB's resulting follow-up project will cover all three islands of the country. It will look to overcome the shortcomings observed in the electricity sector through increased production capacity, reduced technical and commercial losses, and strengthened capacity in the sector. The project will also conduct studies required for the development of the renewable energy potential of the country.</p> <p>The project has 3 main components:</p> <ul style="list-style-type: none"> - Technical support and infrastructure rehabilitation (technical feasibility studies; grid maintenance and rehabilitation; demand-side energy management; promotion of CFLs; development of on-grid renewable energies); - Institutional support (technical assistance for better management of the energy sector and of both MA-MWE and EDA); - Project management, monitoring and evaluation. <p>Under Component 1, geothermal will be promoted alongside other renewable energy sources. The project will support the current exploration phase to confirm the potential, with a goal of building a 10 MW geothermal plant once exploration and drilling have proved successful.</p> <p>The AfDB support is mostly for Technical Assistance, while GEF support will go beyond this, by providing investment support.</p>
Electricity Sector Recovery Project <i>(Projet de redressement du secteur de l'électricité)</i> Main actor: World Bank (WB) Budget: USD 5 million Duration: 38 months (2014 - 2017)	<p>This project is linked to the AfDB project and seeks to complement it. While the AfDB activities focus on technical aspects, the WB activities will focus mainly on the commercial aspects of the power utilities (MA-MWE and EDA). The project objective is to contribute to the improvement of the electricity sector's commercial and financial performance.</p> <p>The project has 3 main components:</p> <ul style="list-style-type: none"> - Assistance to the electricity state-owned enterprises' (MA-MWE and EDA) commercial and financial performance recovery (commercial and financial technical assistance; commercial and financial performance enhancement); - Electricity sector governance; - Project management, monitoring and evaluation.
National Energy Strategy – Action Plan <i>(Elaboration d'une stratégie sectorielle nationale Energie aux</i>	<p>The EU Commission has completed the development of a national energy strategy in Comoros. It is presented as an Action Plan for 5 years.</p> <p>The overall objective of the Strategy is to (i) Manage the level of energy dependency; (ii) Increase access to energy; (iii) Develop credible and sustainable economic viability of the energy sector; and (iv) Promote sustainable development.</p>

<p><i>Comores – Plan d’Action</i></p> <p>Main actor: European Union (EU)</p> <p>Budget: USD 100 million (to be secured)</p> <p>Duration: 2015-2020</p>	<p>Within this action plan, the energy sector will be strengthened and several power plants will be rehabilitated, as well transmission lines. Hydro and solar PV plants will also be developed. The EU will fund 6 solar PV-based mini-grids in Moheli. The Action Plan will also support the Geothermal Initiative (see below) by supporting the exploration activities.</p>								
<p>Comoros Geothermal Initiative</p> <p>Main actors: Government of Comoros, Government of New Zealand, UNDP, African Union</p> <p>Budget: USD 60 million (to be secured)</p> <p>Duration: started in 2014</p>	<p>The Comoros Geothermal Initiative has the objective of assessing and developing the geothermal resource under the Karthala volcano in Grande Comore. There is a potential exploitable geothermal system with the presence of a rift system associated with the active volcano. A geophysical survey undertaken in 2008 suggests that an active geothermal system is present. Now this resource has to be confirmed. A geothermal resource confirmation follows 3 staged phases: (i) reconnaissance, (ii) exploration surveys and (iii) exploration drilling. Once the final phase is reached, with the drilling confirming and quantifying the resource, public and private investors can more easily be attracted to invest in building power plants. But the first 3 staged phases are the most difficult due to two principal reasons: (i) they are very costly and (ii) they are high-risk, as the results might be negative. The resource risk is the most important barrier to geothermal development in the early stages, in all countries, developed or developing. It is typically very difficult to get this phase of resource confirmation financed, in particular in a developing country like Comoros.</p> <p>Following consultations, the Governments of Comoros and New Zealand, along with UNDP, jointly agreed to work in a tripartite partnership to support geothermal surface exploration at the Karthala site. Under the partnership, New Zealand will provide key technical assistance activities to support geothermal surface exploration, while UNDP will provide administrative and logistical support, advisory services and support for resource mobilisation. The Government of Comoros is expected to provide logistical and technical support to the initiative through the Bureau Géologique des Comores (Comoros Geological Bureau).</p> <p>The financing of the initiative is as below (in USD):</p> <table data-bbox="500 1339 1247 1480"> <tr> <td>- Surface Exploration:</td><td>1,300,000¹⁰</td></tr> <tr> <td>- Exploratory drilling:</td><td>30,000,000</td></tr> <tr> <td>- Steam field & power plant 10 MW</td><td>50,000,000</td></tr> <tr> <td>- Gross cost</td><td>81,300,000</td></tr> </table> <p>The estimated potential of the volcano is 43 MW, with possible indications of a larger resource. A 10 MW plant is targeted as the first phase. Surface exploration activities have been recently completed. Funding for this phase came from the Government of Comoros, the Government of New Zealand, UNDP and the African Union. The African Union Commission supported the initiative through its Geothermal Risk Mitigation Facility (GRMF). The objective of GRMF is to encourage public and private investors, as well as public-private partnerships, to develop geothermal prospects for power generation in Eastern Africa by providing grants for two types of activity: (i) surface studies to determine the optimal location of reservoir confirmation wells at the most promising geothermal prospects; (ii) drilling and</p>	- Surface Exploration:	1,300,000 ¹⁰	- Exploratory drilling:	30,000,000	- Steam field & power plant 10 MW	50,000,000	- Gross cost	81,300,000
- Surface Exploration:	1,300,000 ¹⁰								
- Exploratory drilling:	30,000,000								
- Steam field & power plant 10 MW	50,000,000								
- Gross cost	81,300,000								

¹⁰ During the surface exploration phase, the Government of Comoros and UNDP together contributed \$220,000; the Government of New Zealand \$380,000, and the African Union \$844,680. This summed to \$1,444,680, slightly higher than the planned \$1.3 million.

	<p>testing of reservoir confirmation wells at the most promising geothermal prospects to assist developers to secure financing for subsequent reservoir confirmation and/or well field development. So far, the GRMF has contributed USD 0.8 million to complete the surface exploration of Comoros and has committed to contribute up to USD 8 million during the exploratory drilling phase.</p> <p>Within the GEF's well-established role in mitigating risks associated with the introduction of emerging solutions, this proposed GEF-financed project will support this baseline project by developing de-risking tools and create an enabling environment.</p>
Other initiatives	<p>IRENA (Abu Dhabi Fund for Development): \$16 million</p> <p>Comoros is preparing an application through IRENA to source funding from the ADFD, for a \$16 million concessional loan to support the power plant investment phase; this could be considered after exploratory and commercial drilling are completed and the resource is fully confirmed. This application has yet to be lodged and the country has to undergo additional administrative processes to complete its formal admission to IRENA. While this is considered as baseline, IRENA's expected contribution of \$16 million is not counted as co-financing. The GEF-UNDP project solely focuses now on the exploratory/drilling phases and does not take into consideration co-financing that will be channelled to the power plant construction.</p> <p>The Arab Fund (AFESD): AFESD (FADES in French) is the Arab Fund for Economic and Social Development, usually called the Arab Fund. It plans to provide the Government of Comoros with \$10 million, mainly to support the power utility MA-MWE and the Geothermal Initiative. Both Qatari and Saudi Governments are willing to support the Government of Comoros through the AFESD.</p> <p>Clinton Climate Initiative (CCI): CCI is actively present in several SIDS, in the area of sustainable energy. In Comoros, CCI is reviewing the renewable energy options and could be available to support the Geothermal initiative.</p> <p>Global Green Growth Institute (GGGI) : Comoros has also started its admission process to the GGGI. The GGGI global objective in Comoros will be to support economic development and environmental sustainability in the energy, water and land degradation sectors.</p>

Overview of all Relevant Baseline Activities

Initiative	Budget
Government of Comoros	2,000,000
UNDP	1,000,000
Government of New Zealand	500,000
African Union (through GRMF)	8,000,000
African Development Bank	20,000,000
World Bank	5,000,000
European Union	1,000,000
Arab Funds (Qatar and Saudi Arabia)	10,000,000
Total co-finance	47,500,000

3) The proposed alternative scenario, with a brief description of expected outcomes and components of the project

The project aims to contribute to the sustainable development of the Comoros Islands by promoting the country's geothermal renewable energy resource. This would be a truly transformational outcome, as it would, in a single intervention, cover the entire baseload capacity of the island of Grande Comore.

This project will pioneer a comprehensive sustainable energy-based approach in the country via three interrelated components:

- 1) Establish policy, regulatory, legislative and financial de-risking instruments for renewable energy development;
- 2) Upstream geothermal development preparation;
- 3) Public relations and promoting investment.

The proposed UNDP-GEF project only focuses on the exploratory/drilling phases.

The project is consistent with the GEF-6 strategy to address climate change (*CCM-1 Technology Transfer, and Supportive Policies and Strategies*), especially Program 2 (*Develop and demonstrate innovative policy packages and market initiatives to foster new range of mitigation actions*) because its principal objective is to facilitate investment in a renewable energy source in Comoros.

Component 1: Establish policy, regulatory, legislative and financial de-risking instruments for renewable energy development

This component will enable market transformation of the energy sector by developing a streamlined and comprehensive market-oriented energy policy and legal/regulatory framework for renewable energy-based electricity generation for both the power utilities and IPPs. The component activities will result in an increased share of renewable energies in the energy mix (both on-grid and off-grid). This component will be closely linked to baseline activities being implemented by AfDB, WB and the EU. Indeed, these baseline activities will address core barriers to energy sector management (power utility difficulties, transmission lines, key actors in the energy sector, etc.). The project will facilitate policy dialogue and identification of the most suitable financial instruments for Comoros, as well as elaborate the required regulations, methodologies and decision-making tools for their adoption and implementation.

This component will help to design policy instruments for long-term viability of renewable energy-based electricity generation, while developing a number of financial de-risking instruments (technical report on grid capacity requirements, establishing a transparent procurement mechanism for selection of IPPs and off-take arrangements, standardisation of PPAs (Power Purchase Agreements), long-term concessions, appropriate tariffs and feed-in tariffs, a partial risk guarantee scheme, build-own-operate (BOO) and build-own-operate-transfer (BOOT) modalities, etc.). The PPG phase will help to design in depth the appropriate policy and financial de-risking instruments applicable to Comoros. In addition, during the PPG phase, a mechanism will be explored that could convert GEF grants into loans in case the outcome of drilling is positive (a developer could take this on). The idea is to package GEF grant support as a reimbursable grant, to be repaid by the developer (an IPP that will be competitively selected) to the Government (possibly as an interest-free loan) in the event of predetermined conditions being triggered.

This component will help to design policy instruments for long-term, viable renewable energy generation, while developing financial instruments to promote the involvement of the private sector. There are currently two main barriers to renewable energy-based systems being introduced: the high upfront investment and a financially-viable tariff. The project intends to work on the removal of these barriers. The instruments to be developed in this project will be applicable to both on-grid and off-grid systems.

The proposed integrated approach (a combination of policy and financial de-risking instruments) for addressing market barriers is based on UNDP experience in this area, as summarised in “De-risking Renewable Energy Investment”, published in 2013. An illustration is given below:

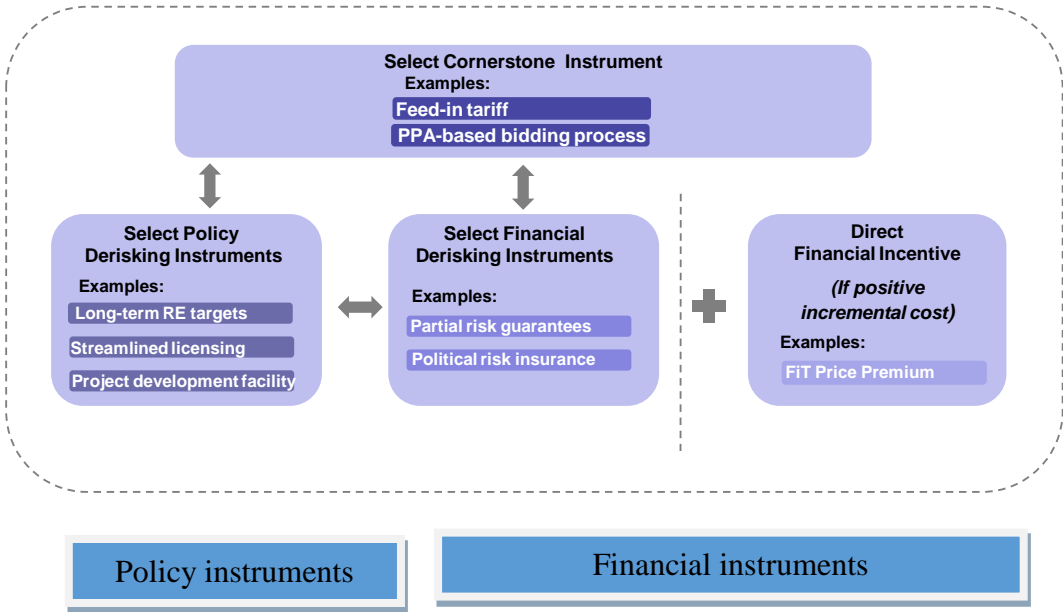


Figure: Integrated approach for addressing market barriers via a combination of policy and financial derisking instruments¹¹

Component 2: Upstream geothermal development preparation

This component will enable the assessment and confirmation of the geothermal resource availability around the Karthala volcano. It will be aligned with the baseline Comoros Geothermal Initiative.

As stated earlier, a geothermal resource confirmation follows 3 staged phases: (i) reconnaissance, (ii) exploration surveys and (iii) exploration drilling. In the case of Comoros, the reconnaissance has already taken place (in 2008), through an initial geophysical survey undertaken by the Kenya Electricity Generating Company (KenGen)¹².

EXPLORATION		DEVELOPMENT	PRODUCTION
Surface Exploration	Exploration drilling	Production drilling	Power plant establishment
1 year	2 years	1.5 years	

The surface exploration has also been completed, undertaken by the Comoros Geological Bureau and a New Zealand firm. It was funded by the Government of Comoros, the Government of New Zealand, UNDP and the African Union. The main conclusion of the surface exploration was that the resource is estimated to have a capacity of approximately 43 MW, with possible indications of a larger resource. This is sufficient for a planned development of 10 MW. As the possible development area is at high elevation, there are major logistical issues in providing access roading and a water supply for drilling. This is further complicated by a high level of volcanic risk. Nevertheless, power development is possible, although at higher cost than most geothermal developments. The initial plan is for two drilling pads to drill three exploration holes, with the scope for more wells if required.

¹¹ Source: Derisking Renewable Energy Investment, UNDP (2013).

¹² Comoros Geothermal Resource Assessment – KENGEN (2008).

Due to the high level of volcanic risk, a volcanic hazard assessment was also conducted. The report highlighted that (i) the hazard assessment remains mostly qualitative; (ii) over the past 160 years, eruptions at the Karthala Volcano have occurred on average every eight years. The last eruption occurred in 2007. The longest recorded interval between eruptions was 14 years, prior to and after the 1991 eruption; (iii) any infrastructure installed in the targeted areas would be best located outside a 3 km radius zone of the volcano, and away from lava flow pathways; and (iv) mitigation measures should be put in place, especially concerning ash fall which is likely to affect any site on the volcano. A suitable level of volcano monitoring is also essential.

The next step, building on the work already done, will be the exploratory drilling. This phase will last for 2 years and its estimated cost is US\$ 30 million¹³. Drilling will prove the characteristics of the reservoir and demonstrate the performance of wells for production and injection. This will provide the basis for assessing the technical and financial viability of a power plant development. The African Union has committed to fund US\$ 8 million, while the remaining will come from various donors. The GEF support will ensure environmental and social safeguards, to ascertain baseline conditions and the steps that may be necessary to mitigate any impacts so that geothermal can be developed in a safe and sustainable manner. In addition, the approach will be to forego additional exploratory drilling but to immediately sink production wells. Although more expensive, this will avoid the higher costs involved if done separately. Also, the production wells, if successful, would already be part of the field development, which is an integral part of the investment costs for a future geothermal power plant. So it would save on that front and reduce the required investment costs of the power plant. In terms of realising that investment (production wells), a tender to an IPP will be proposed. The idea is to package GEF grant support as a reimbursable grant, to be repaid by the developer (an IPP that will be competitively selected) to the Government (possibly as an interest-free loan) in the event the exploratory drilling leads to a positive decision to move forward with investment in the power plant.

The resource risk is the most important barrier to geothermal development in the early stages, in all countries, developed or developing. It is typically very difficult to get this phase of resource confirmation financed, in particular in a developing country like Comoros. The government does not have the ability to fund this phase on a debt basis and needs grant funding. By committing its funding to this stage of geothermal resource development, the GEF will send a strong signal as a first-mover and by sharing some of the risk. This is a fully incremental activity that will attract other donors to share in the risk involved by contributing their own co-finance. This will lead to an acceleration in the adoption of geothermal technology, which has truly transformational potential for Comoros.

During the PPG phase, UNDP's social and environmental safeguards will be applied to minimise any associated risks for geothermal exploration.

Component 3: Public relations and promoting investment

This component will address the "Investor awareness and perception of risks" barrier. It will help to collect and present all essential information for potential geothermal power plant developers, such as: a) characteristics of the Karthala site; b) the required process for permitting and licensing; c) policies and regulations governing renewable energy project development in Comoros; d) information about local technology service providers; and e) potential sources of financing and incentive. The information will be presented on-line and published as a geothermal investor guide. Support will be provided to the Comoros Geological Bureau to ensure the guide's regular update and wide dissemination. The project will also promote investment opportunities in geothermal plants among local and foreign partners, financial institutions, developers, social impact investors via targeted public relations campaigns, conferences and other marketing and communication tools.

¹³ All estimated figures are sourced from: **Project Document for Geothermal Development on Grande Comore**, Dr. Mike Allen, (June 2015).

4) Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing

Geothermal power development is expected to be attractive in terms of cost, energy security and sustainability of supply, environmental benefits and for enabling improved access to electricity for a greater portion of the population. If the initiative achieves its goal, the geothermal plant will complement the existing electricity grid and is expected to provide a reliable, cost-competitive source of baseload power to households, private companies and government buildings. This will be truly transformative at the national level.

Overall, the use of GEF funds is mainly for technical assistance, with the Government and its funding partners picking up the investment costs and providing risk insurance. For the GEF resources that are deployed in direct support of the exploration drilling, a mechanism will be explored during the PPG that will allow reimbursement of the GEF grant to the Government (for further reinvestment in geothermal energy) in the event of a positive decision to move forward with power plant development.

The GEF incremental/additional cost reasoning derives mainly from the risk associated with the resource assessment. There are currently no private investors involved, due to the uncertainty of the resource, but also due to the high risk of investing in Comoros, given there is no existing legislation covering potential IPP activities. In the WB/IFC 'Doing Business 2016' data, Comoros is ranked 154 out of 189 economies¹⁴. GEF involvement will be designed to mitigate that risk by providing de-risking policy and financial instruments, which will help to attract additional investment in the future. A component-by-component assessment of the incremental activities and expected GEBs is described below:

Baseline practices	Alternative to be put in place by the project	Expected Global Benefits
Component 1: Establish policy, regulatory, legislative and financial de-risking instruments for renewable energy development		
Electricity generation in Comoros is still heavily reliant upon fossil fuel. An additional 18 MW heavy fuel oil based plant is even planned in the near future. There are no proper incentives for investment in renewables. Power utilities are underperforming due to technical, financial and capacity related issues. There are no de-risking instruments in the country to mitigate the off-take risk IPPs will face in deciding whether to invest in a renewable energy plant and the associated financial costs that come with that risk. Policy-makers have no environmental methodology, safeguards and climate-friendly guidelines for geothermal development. AfDB is supporting the energy sector. This support is mainly on technical aspects. AfDB-funded activities will support the power utilities (MA-MWE and EDA) by strengthening the (i)	GEF-funded activities will enable market transformation of the energy sector by developing a streamlined and comprehensive market-oriented energy policy and legal/regulatory framework for renewable energy-based electricity generation for both the power utilities and IPPs. GEF involvement will help to design policy instruments for long-term viability of renewable energy-based electricity generation, while developing financial de-risking instruments (technical report on grid capacity requirements, establishing a transparent procurement mechanism for selection of IPPs and off-take arrangements, standardisation of PPAs, long-term concessions, appropriate tariffs or feed-in tariffs, a partial risk guarantee scheme, build-own-operate (BOO) and build-own-operate-transfer (BOOT) modalities, etc.). Putting in place this favourable environment will not only benefit geothermal, but all types of renewable energies. This will lead to an increased share of renewable energies in the energy mix.	The electricity generated from geothermal power plants facilitated by the project will result in a reduction of 1,520,100 t O ₂ over the technology's 30 year lifetime. The establishment of this framework will also apply to all future investments in renewable energies, and thus can be estimated to indirectly contribute to additional emission reductions post-project (this will be defined at the PPG phase).

¹⁴ <http://www.doingbusiness.org/data/exploreeconomies/comoros>

<p>infrastructure rehabilitation: distribution lines (grid extension and maintenance); already-existing electricity production (repair and maintenance of fossil fuel based generators and some small-hydro plants); and (ii) institutional support: capacity building of power utilities' staff and other key energy actors for better management.</p> <p>WB is also supporting the energy sector. This support is mainly on commercial aspects. WB-funded activities will support the power utilities (MA-MWE and EDA) by improving their commercial and financial performance (cost recovery).</p> <p>EU support to the energy sector is mainly in the form of promoting energy access and sustainable energy. The EU primarily focuses on off-grid energy in rural areas (renewable energy mini-grids). But the EU has also developed an Action Plan for the next 5 years for all types of energies. The Action Plan includes development of on-grid renewable (solar, hydro, geothermal). But there is no specific budget for the Action Plan (estimated to require over 100 million USD), and it includes all planned activities from a range of donors (AfDB, WB, UNDP, etc.). In other words, the geothermal development under the Action Plan and the Comoros Geothermal Initiative are effectively the same.</p>	<p>GEF-funded activities will support the energy sector, but mainly on the production side (electricity generation). If there were only AfDB or WB activities, the energy sector will indeed gain some improvement, but on the transmission and distribution sides only. For the production side, business as usual will likely continue, with electricity generation relying mainly on fossil fuel. GEF involvement will enable the production side of the energy sector to be sustainable, with the development of renewable energy sources, by putting in place an enabling environment (policy and financial instruments) for the long-term viability of the production (by both power utilities and IPPs).</p> <p>Supporting only the transmission and distribution sides (baseline) will not be sufficient to strengthen the energy sector. Moreover, supporting only the generation side (alternative scenario) will not be sufficient, in a context characterised by an unmaintained grid (40% transmission losses) and power utility bankruptcy (only 15% of the production is invoiced). A coherent and complementary intervention through both baseline and alternative scenarios is the best way to support sustainably the energy sector in Comoros.</p>	
Baseline practices	Alternative to be put in place by the project	Expected Global Benefits
Component 2: Upstream geothermal development preparation		
<p>A tripartite partnership between the Government of Comoros, the Government of NZ and UNDP has initiated the Comoros Geothermal Initiative.</p> <p>The Government of Comoros will provide logistical and technical support to the initiative through the Comoros Geological Bureau. The Government of NZ will provide key technical assistance activities to support geothermal surface</p>	<p>The support of the GEF funds is crucial. Although apparently small, it is likely that funding for the project will necessarily be drawn from a range of donors, each of whom will provide modest amounts of funding, particularly at the early stage of the project. At this stage, the surface explorations have confirmed the geothermal resource. Other barriers, such as the need for heavy infrastructure work or volcano hazards, may prevent the resource from being exploited.</p>	<p>The electricity generated from the geothermal power plant facilitated by the project will result in a reduction of 1,520,100 tCO₂ over the technology's 30 year lifetime.</p>

<p>exploration. UNDP will provide administrative and logistical support, advisory services and support for resource mobilisation. So far on resource mobilization, UNDP has supported the Comoros Geological Bureau to apply to the GRMF and successfully engage the African Union. UNDP is also supporting the country to apply for IRENA and GEF funding.</p> <p>GRMF is providing a sound and comprehensive monitoring role for the project, and its role will help ensure that decisions for each step are made on the best possible basis and with a thorough analysis of risks for the next stage and subsequent activities.</p>	<p>GEF involvement in the exploration phases will ensure that environmental and social safeguards are taken into consideration, to ascertain baseline conditions and the steps that may be necessary to mitigate any impacts so that geothermal can be developed in a safe and sustainable manner. It will also strengthen the Government's capacity to attract and negotiate with potential developers. The support of GEF will also help encourage the less experienced donors (in geothermal) to make a commitment to contribute.</p> <p>GEF's involvement in the exploration phase is not only for demonstration or providing a technical result, but extends far beyond, mitigating the high risk associated with the introduction of geothermal in Comoros.</p>	
Baseline practices	Alternative to be put in place by the project	Expected Global Benefits
Component 3: Public relations and promoting investment		
<p>There is very little data about renewable energy in general, and geothermal in particular, in Comoros – notably about prospective sites and their geological, climatic and other characteristics. Basically, there is no single information point where a potential developer can receive required guidance and data to make an informed investment decision.</p>	<p>GEF-funded activities will help to collect and present all essential information for potential geothermal power plant developers, such as: a) the characteristics of the Karthala site; b) the required process for permitting and licensing; c) policies and regulations governing renewable energy project development in Comoros; d) information about local technology service providers; and e) potential sources of financing and incentives. The information will be presented on-line and published as a geothermal investor guide. Support will be provided to the Comoros Geological Bureau to ensure the guide's regular update and wide dissemination. GEF-supported activities will also promote investment opportunities in geothermal plants among local and foreign partners, financial institutions, developers, social impact investors via targeted public relations campaigns, conferences and other marketing and communication tools.</p>	<p>The electricity generated from the geothermal power plant facilitated by the project will result in a reduction of 1,520,100 tCO₂ over the technology's 30 year lifetime.</p> <p>PR and investment promotion activities will also apply to all future investments in renewable energies and thus can be estimated to indirectly contribute to additional emission reductions post-project (this will be defined at the PPG phase).</p>

UNDP's added value in the geothermal development process in Comoros

UNDP is one of the few agencies present in the country. Major MDBs (WB, African Development Bank, etc.) do not have a permanent office. Their presence are usually limited to 1 or 2 project staff. UNDP has:

- *The ability to mobilise and make available technical expertise to develop policies and strategies, particularly in social sectors, governance and environmental management, and disaster risk.*
- *Knowledge and ability to take into account the rights and basic needs of the most vulnerable segments of the population.*
- *The focus on capacity building in all areas of support.*
- *The speed and ease of mobilisation in the case of major events (disasters, emergencies, opportunities, etc.)*
- *Confidence among the population and national and international partners.*

Specifically in the area of energy and project management, UNDP has:

- *The first interest in, and the first public statement on the potential of, the geothermal resource from the Khartala volcano.*
- *A privileged and trusted relationship with the Gouvernement of Comoros.*
- *Facilitated the involvement of other donors in the geothermal cause, such as the Government of New Zealand and the African Union. UNDP continues to facilitate the involvement of other donors such as IRENA, the Qatari Government, the Saudi Government, etc.*
- *Developed large infrastructure projects, such as in the area of potable and drinking water.*
- *Developed a range of projects in the area of climate change and environment: green economy, renewable energy, climate change adaptation, biodiversity and protected areas, chemicals and waste, etc.*
- *So far developed 9 GEF-funded projects in Comoros. It is also implementing the SGP programme in the country.*
- *A high delivery rate in project implementation.*

5) Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)

A very preliminary and conservative estimate indicates that the total direct project CO₂ emissions reduction from the deployment of an additional 10 MW of installed capacity from the geothermal plant facilitated by this project will be 1,520,100 tonnes of CO₂e¹⁵, which translates into an abatement ratio of \$3.9 of GEF funds per tCO₂ reduced.

6) Innovation, sustainability and potential for scaling up

Innovativeness: The proposed project is innovative and transformational for Comoros, by promoting a new type of renewable energy source, so far only exploited in a limited way in Africa. Only 3% of the geothermal potential is exploited in Africa (geothermal power production totals less than 500 MW, while its potential is estimated to be over 15,000 MW). In addition, the proposed approach in cost-effective risk reduction is at the core of the proposed UNDP-GEF project's strategy, which makes it highly innovative. The project will adopt a comprehensive market-oriented approach to assess and reduce risks to private investment in renewable energy in Comoros. The proposed approach and methodology which enables risk quantification and selection of ideal policy-financing mix are described in two UNDP publications: "Transforming On-Grid Renewable Energy Markets" (2012) and "Derisking Renewable Energy Investment" (2013).

¹⁵ **CO₂ emission reductions attributed to a total of 10 MW geothermal plant:**

Assumptions: (1) Capacity of the plant: 10 MW; (2) geothermal power generation load factor = 90%; (3) Useful life of geothermal plant = 30 years; (4) Comoros grid emission factor (average Africa) = 0.6427 tCO₂/ MWh.

Calculations:

Annual Electricity Generation = 10_{Mw} * 8760_{hours} * 0.9 = 78,840 MWh

Annual CO₂ emission reduction = 0.6427 x 78,840 = **50,670 tonnes/year**

Lifetime CO₂ emission reduction = 50,670 x 30 = **1,520,100 tonnes**

Sustainability: Developing geothermal resources in Comoros will specifically contribute to reliability of supply, a greater access to, and more affordable electricity prices for, households, businesses, Government and MA-MWE. It will also provide longer-term savings from reductions in foreign exchange transaction costs due to the reduced purchase of diesel fuel. In addition, by establishing a new and mixed policy and financing instrument approach, financial sustainability of renewable energy system will be ensured.

Potential for scaling-up: Comoros has considerable potential for harnessing renewable energy sources (solar, hydro, wind and geothermal). The geothermal plant can be increased from 10 to 50 MW over time, as demand for baseload electricity increases. The scale of this project is relatively small; however, its impact for Comoros can be really significant (and transformational for the power sector on the island of Grande Comore) and also provide a strong example for other SIDS developments. GEF's involvement will help reinforce this model and support its adoption elsewhere.

2. **Stakeholders.** Will project design include the participation of relevant stakeholders from [civil society organizations](#) (yes ☒ /no ☐) and [indigenous peoples](#) (yes ☐ /no ☒)? If yes, identify key stakeholders and briefly describe how they will be engaged in project preparation.

Stakeholders	Expected role in project design/preparation
Minister of Production, Environment, Energy, Industry and Handicrafts	<ul style="list-style-type: none"> • Coordination of the overall project preparation activities • Ensure consistency of the project and ensure the feasibility of proposed outputs • Gather key stakeholders during project preparation • Help in the co-financing letter commitments
Vice-Presidency in charge of the Ministry of Finance	<ul style="list-style-type: none"> • Lead and provide guidance on the design of financial de-risking tools • Assist in the establishment of financial mechanisms and incentives
Power Utilities (MA-MWE and EDA) and potential IPPs	<ul style="list-style-type: none"> • Provision of data as needed (grid characteristic, installed capacity, energy demand, etc. • Ensure consistency of the project and ensure the feasibility of proposed outputs, especially on PPAs • Design of O&M models
Multilateral donors: AfDB, WB, ADFD, IRENA, EU, GoNZ, Governments of Qatar, Saudi Arabia, etc.	<ul style="list-style-type: none"> • Commitments for co-funding/sharing in financial risk/participation in financing • Sharing of experience and knowledge
NGOs (CCI, GGGI, etc.)	<ul style="list-style-type: none"> • Commitments for co-funding • Share of experience
Civil society organisations	<ul style="list-style-type: none"> • Organisation and conduct of PR and awareness-raising campaigns • Ensure social, environmental and social safeguards are taken into account • Knowledge-sharing
Local consumer organisations	<ul style="list-style-type: none"> • Organisation and conduct of awareness-raising campaigns • Ensure good buy-in from population
Women's groups and gender-based organisations	<ul style="list-style-type: none"> • Organisation and conduct of awareness-raising campaigns • Ensure good buy-in from women

3. **Gender Equality and Women's Empowerment.** Are issues on [gender equality](#) and women's empowerment taken into account? (yes ☒ /no ☐). If yes, briefly describe how it will be mainstreamed into project preparation (e.g. gender analysis), taking into account the differences, needs, roles and priorities of women and men.

Gender considerations are taken into account. Gender dimensions in the energy sector have great impacts on access to services, exposure to risks, and access to benefits. Thus it has to be considered for effective policy-making and project design. The project will enable an integrated gender perspective throughout project activities, especially in enabling better access to modern energy services. Access to reliable energy will help women's organisations to create income-generating activities. A reliable and secure supply of electricity is fundamental to the well-being and health of women and families, and cannot be provided under existing conditions where the structure and operations of the electricity system in Grande Comore is clearly inadequate.

4 Risks. Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable).

The project has been designed in stages that progressively reduce risk, while the amount of funding invested in each stage increases. This way of structuring the project will minimise the overall risk and ensure that the investment that is at risk of being lost is commensurate with the overall risk level at any given time. At this stage, the surface explorations have confirmed the geothermal resource.

Risk	Level of Risk	Mitigation Action
Political risk: Project will need long-term commitments such as PPPs or concessional loans. With the high turnover of the presidency, with several putsches in the past years, these commitments may not be respected.	P=3 I=3	The current political situation in the country is stable. A presidential election will take place in April 2016, but without major threats to the country's stability. However, if instability occurs, to mitigate the risk the project will use UNDP branding to ensure compliance with commitments.
Policy risk The success of this project will be determined to a large degree by adoption and effective enforcement of the proposed policies. Lack of political support may jeopardise the achievement of immediate results and overall impact.	P=2 I=3	Initial consultations with the Government of Comoros have indicated high (and high-level) political buy-in in this project. Proposed policy instruments will be acknowledged.
Uncertainty of the availability of geothermal resource Explorations may reveal that no utilisable resource is available.	P=3 I=5	Preliminary results so far have led to an estimation of the potential of the volcano of between 40-50 MW, and possibly more. A recent series of surface explorations have further confirmed the geothermal resource. The uncertainty now remains only on how to best harness the resource, which is one of the objectives of this project.
Technology risk Geothermal technology might be too advanced in a country like Comoros.	P=4 I=3	The project intends to build partnerships with experienced geothermal operators that will share experience and provide capacity building.
Financial risk The power utilities are almost bankrupt and might not be able to ensure their commitments such as PPAs.	P=4 I=5	Power utilities are benefiting from various support programmes from development banks (WB and AfDB) that will enable them to be restructured in a more efficient way. This risk will also be addressed by targeted financial de-risking tools under the GEF project.
Geological risk	P=3 I=3	The project will ensure that proper and adequate environmental and social safeguards are taken into account during project implementation. This is in

Risk	Level of Risk	Mitigation Action
Geothermal development is always associated with environmental and social risks. In addition, the volcano (Karthala) may erupt.		line with UNDP's policy on Social and Environmental Screening.
Climate risk Climate change is predicted to cause changes and increase the variability of Comoros rain patterns. This may cause floods or mud flows in mountains, such the Mount Karthala that hosts the volcano.	P=2 I=2	Proper criteria and safeguards will be developed for each intervention (exploration, drilling, etc.) on Mont Karthala to take into account potential extreme climate change-driven events, such as floods, mud flows and drought.
Overall Risk Rating	Moderate	

5. *Coordination.* Outline the coordination with other relevant GEF-financed and other initiatives.

During the PPG phase, in-depth consultations will be undertaken to establish partnerships and practical modalities for linking and collaborating with several ongoing and planned renewable energy projects/programmes in Comoros. This is not only to avoid unnecessary duplication but also to ensure that GEF resources build on the progress and achievements made to date through such initiatives. A strategy and plan for collaboration with relevant ongoing and planned initiatives such as identified above will be prepared during the preparatory phase, including defining the roles and responsibilities of critical stakeholders.

The proposed project is one of a series of similar UNDP-GEF initiatives aimed at promoting de-risking renewable energy investment. The project will also coordinate with ongoing GEF funded climate change projects in Comoros.

The proposed project is one of a series of similar GEF initiatives aimed at promoting geothermal developments in other islands (such as St. Lucia, St Vincent, Dominica, and Vanuatu). There is already a sharing of experience between the Caribbean and Comoros - both indirectly and directly through the New Zealand connection as New Zealand is active in St Lucia, Grenada, Dominica and St Vincent. New Zealand is also supporting efforts in Vanuatu. In all cases, there is a considerable element of donor funding being applied to surface exploration and exploratory drilling. None of these small nations can move forward effectively without such support. These islands share the same market transformation approach and model for geothermal-based electricity generation. The proposed project will benefit from those projects, but will also provide its own experience to others, especially within the African and Least Developed Country context. Sharing of experience and knowledge includes analysis and presentation of lessons-learned, organisation of face-to-face and virtual networking, online knowledge-sharing and outreach activities and events.

6. *Consistency with National Priorities.* Is the project consistent with the National strategies and plans or reports and assessments under relevant conventions? (yes ☒ /no ☐). If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, etc.

The proposed project is in line with the following national strategies and plans:

- *National Energy Strategy: The Government of Comoros has finalised a national energy strategy, with the support of the European Union Commission. Renewable energy development is one of the main focuses of the action plan.*
- *CPD 2015 – 2019: UNDP is supporting the Government of Comoros through a CPD (Country Programme Description) from 2015 and 2019. One of the priorities of this CPD is to promote renewable energies in order to meet the country energy needs.*
- *The Second National Communication to the UNFCCC (2012) of Comoros highlights that the energy sector is the third-largest contributor to GHG emissions, after the LUCF and agriculture sectors, and is expected to be the largest contributor by 2030. The Second National*

Communication identifies renewable energy technologies as being able to play an important role in helping to reduce GHG emissions.

- *The Intended Nationally Determined Contribution – INDC (2015) of Comoros specifies a target of reducing the country's GHG emissions by 46% by 2020, 69% by 2025 and 84% by 2030, compared with the baseline scenario. This is equivalent to 441,700 tCO₂eq. The GHG reductions will come mainly from the energy, agriculture and forestry sectors. Geothermal is clearly seen as a major potential for GHG reduction. The INDC indicates that “geothermal remains an asset and should receive maximum attention for its exploitation in the future”. The reduction target of 84% by 2030 assumes 14 MW of installed geothermal capacity.*

7. Knowledge Management. Outline the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

Knowledge management is very important for this project, due to its innovativeness. Component 3 will specifically deal with knowledge management. Through this component, the project will help to collect and present all essential information for potential geothermal-based power plant developers. The information will be presented on-line and published as a geothermal investor guide. Support will be provided to the Comoros Geological Bureau to ensure the guide's regular update and wide dissemination. Activities within the region and the active engagement of the GRMF / African Union in this project is generating a high level of inter-country collaboration and sharing of information.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

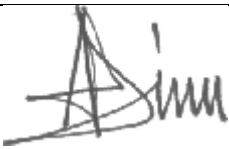
A. RECORD OF ENDORSEMENT¹⁶ OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):

(Please attach the [Operational Focal Point endorsement letter\(s\)](#) with this template. For SGP, use this [SGP OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Mr. Said Youssouf Mohamed	Secretary General / Ministry of Production and GEF OFP	MINISTER OF PRODUCTION, ENVIRONMENT, ENERGY, INDUSTRY AND HANDICRAFTS	12/08/2014

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies¹⁷ and procedures and meets the GEF criteria for project identification and preparation under GEF-6.

Agency Coordinator, Agency name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email
Adriana Dinu Executive Coordinator, UNDP GEF		April 6, 2016	Saliou Toure Technical Advisor EITT	+251 912 503 320	Saliou.toure@undp.org

¹⁶ For regional and/or global projects in which participating countries are identified, OFP endorsement letters from these countries are required even though there may not be a STAR allocation associated with the project.

¹⁷ GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, and SCCF

C. ADDITIONAL GEF PROJECT AGENCY CERTIFICATION (APPLICABLE ONLY TO NEWLY ACCREDITED GEF PROJECT AGENCIES)

For newly accredited GEF Project Agencies, please download and fill up the required [GEF Project Agency Certification of Ceiling Information Template](#) to be attached as an annex to the PIF.

Annexes:

- [Comoros surface exploration: Geophysics and Summation](#)
- [Geothermal Business Plan \(Project Document for Geothermal Development on Grande Comore\)](#)
- [Volcanic hazard assessment at the Karthala volcano](#)