International Renewable Energy Agency

# IRENA Handbook on Renewable Energy Nationally Appropriate Mitigation Actions (NAMAs) for Policy Makers and Project Developers

## About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organization dedicated to renewable energy.

In accordance with its Statute, IRENA's objective is to "promote the widespread and increased adoption and the sustainable use of all forms of renewable energy". This concerns all forms of energy produced from renewable sources in a sustainable manner and includes bioenergy, geothermal energy, hydropower, ocean, solar and wind energy.

As of November 2012, the membership of IRENA comprised 158 States and the European Union (EU), out of which 103 States and the EU have ratified the Statute.

## Acknowledgement

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The Handbook benefitted from an internal IRENA review, as well as from valuable comments and guidance provided by: Andre Eckermann (Deutsche Gesellschaft für Internationale Zusammenarbeit-GIZ), Juan Pablo Castro (ClimateFocus), Isaac Kiva (Kenya), Hugh Sealy (Grenada), Klaus Wenzel (GIZ), Laura Würtenberger (ECN) and Tania Zamora (Peru).

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This Handbook is available for download from www.irena.org/Publications.

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# Acronyms

| | |
|---|---|
| BAU | Business As Usual (scenario) |
| CCAP | Climate Change Action Plan |
| CDM | Clean Development Mechanism |
| $CO_2$ | Carbon dioxide |
| $CO_2e$ | Carbon dioxide equivalent |
| COES | System Economic Operation Committees (Peru) |
| COP | Conference of the Parties |
| FiT | Feed-in Tariff |
| GDP | Gross Domestic Product |
| GEF | Global Environment Facility |
| GHG | Greenhouse Gas |
| GNEP | Grenada National Energy Policy |
| GRENLEC | Grenada Electricity Services Limited |
| GW/GWh | Gigawatt/Gigawatt-hour |
| IFC | International Finance Corporation |
| INDECOPI | National Institute for the Defense of Competition and the Protection of Intellectual Property (Peru) |
| IPP | Independent Power Producer |
| IRENA | International Renewable Energy Agency |
| kV | Kilovolt |
| kW/kWh | Kilowatt/Kilowatt-hour |
| MENA | Middle East and North African Region |
| MINAM | Ministry of the Environment (Peru) |
| MINEM | Ministry of Energy and Mines (Peru) |
| MRV | Measurement, Reporting and Verification |
| MW | Megawatt |
| Mt | Megatonne |
| NAMA | Nationally Appropriate Mitigation Action |
| OECD | Organisation for Economic Co-operation and Development |
| OSINERGMIN | Supervisory Organism of Investment in Energy and Mines (Peru) |
| PoA | Programme of Activities |
| PPA | Power Purchase Agreement |
| PV | Photovoltaics |
| RD&D | Research, Development & Demonstration |
| RE | Renewable Energy |
| RECs | Renewable Energy Certificates |
| RER | Renewable Energy Resources |
| RET | Renewable Energy Technology |
| RoR | Run-of-River (Hydro plant) |
| SARI | South African Renewables Initiative |
| SEAP | Sustainable Energy Action Plan (Grenada) |
| SIDS | Small Island Developing States |
| SREP | Scaling-up Renewable Energies Programme (Kenya) |
| TNA | Technology Needs Assessment (UNEP) |
| TWh | Terawatt-hour |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environment Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |

# Foreword

Over the past five years, increasing attention has focused upon a promising new instrument to reduce carbon emissions in developing countries – one which does not attempt to impose a one-size-fits-all solution, but which takes advantage of national-led initiatives tailored to each country's specific needs.

This instrument is called 'Nationally Appropriate Mitigation Actions', or NAMAs, and is driven by the conviction that appropriate government policies and activities can mobilise public and private investment in low-carbon development. NAMAs vary considerably in scope – ranging from large-scale initiatives costing tens of millions of dollars, to single pilot projects. They might be financed domestically, or internationally. But they all share the same objective: overcoming barriers to a significant and measurable reduction in $CO_2$ emissions, country by country, with global impact.

NAMAs have raised some important questions, which still need to be addressed. Is their voluntary, diverse nature sufficient to tackle a global problem like climate change? Can they be translated into practical initiatives that operate at scale? Despite these concerns, NAMAs continue to gain momentum, and by mid-2012, more than 50 countries have proposed activities under the UNFCCC.

This Handbook illustrates how NAMAs offer a genuine opportunity to promote investment in renewable energy – a proven and effective route to reducing carbon emissions.

Despite improving technology and falling costs, obstacles to accelerating growth in renewable energy remain stubbornly entrenched, and its full potential is yet to be realised. IRENA believes that NAMAs offer a pragmatic pathway to overcome these obstacles.

The Handbook's comprehensive approach aims to facilitate implementation, enhance transparency and engage stakeholders. It is illustrated by compelling case studies from Peru, Kenya and Grenada, demonstrating how policies which promote renewable energy can be used in the NAMA framework.

I am confident this Handbook can serve as the basis of an international dialogue aimed at developing renewable energy NAMAs. I hope its conclusions are widely shared, furthering IRENA's goal of becoming a hub for the exchange of information, and serving as a beacon for the development of renewable energy NAMAs by its Members.

**Adnan Z. Amin**
Director-General, IRENA

# Executive Summary

## Context

This Handbook focuses on the role that Nationally Appropriate Mitigation Actions (NAMAs) can play in promoting Renewable Energy (RE) in developing countries. The concept of NAMAs was developed in the negotiations carried out under the United Nations Framework Convention on Climate Change (UNFCCC) to denote planned, voluntary greenhouse gas (GHG) mitigation actions in countries that do not have a legally binding emissions commitment. Notifying a NAMA thus practically means putting a UNFCCC-backed label on national development activities with mitigation effects. RE being carbon dioxide-free is a perfect candidate for a NAMA as it combines development benefits through the provision of energy with GHG reduction. A RE NAMA perfectly embodies a "green growth" path.

## What are NAMAs?

NAMAs are public sector interventions to mobilise private participation in low-carbon development and can range from multi-sector strategies across specific policy instruments to single pilot projects. A wide range of policies promoting RE is conceivable as a NAMA, involving non-market-based incentives, market mechanisms or regulations. Large-scale, policy based NAMAs can easily cost tens of millions of US dollars. Industrialised countries have pledged to support NAMAs. A significant share of the USD 30 billion promised as "fast-start finance" for climate change mitigation and adaptation in developing countries and the USD 100 billion per year from 2020 onwards could flow into NAMAs.

Currently, two kinds of NAMAs have been defined under the UNFCCC: those developed with domestic means (unilateral NAMAs) and those requiring international support to cover NAMA costs (supported NAMAs). A third option discussed would credit emission reductions and make them tradable on the carbon market (credited NAMA). However, this latter alternative has not been approved by the Parties to the UNFCCC as of October 2012.

So far, over 50 countries have proposed NAMAs, and a registry has been set up under the UNFCCC to facilitate the flow of support from industrialised to developing countries and to ensure transparency.

## NAMAs as a Tool to Overcome Barriers to Renewable Energy Technology Deployment

Barriers for Renewable Energy Technology (RET) deployment can be political, economic, financial, legal, regulatory, technical, institutional or even cultural in nature. Many of these barriers translate into higher costs or risk premiums compared to conventional energy technologies. Thus, economic incentives, such as tax exemptions or feed-in tariffs, are required to promote RET. Beyond those, a combination of measures will be required for a cost-effective transfer and diffusion of RETs. An internationally viable RE support mechanism may encourage policy makers to remove institutional and political barriers.

NAMAs represent a wide-ranging support vehicle. Depending on their nature, NAMAs can take various forms of instruments that support RET development. They can include broad strategies (*e.g.* a RE percentage target), sweeping programmes, policy measures, awareness raising campaigns for citizens' use of renewable electricity, and specific lighthouse projects financed by governments. Support can also include technical assistance or capacity building measures.

Policy-based NAMAs generally take the form of monetary and/or non-monetary incentives. The former can be broadly classified as non-market based incentives (*e.g.* grants, loan guarantees and tendering) and as market-based incentives (*e.g.* Renewable Energy Certificates, green labelling). Non-monetary NAMAs can take the form of mandatory grid access for RET operators or technical assistance to operate the technology and labelling of power produced through RETs.

## How to Get a NAMA Concept off the Ground

Putting forward a certain NAMA idea is only the first in a long series of steps towards its practical implementation. Before a NAMA is implemented and emission reductions are monitored, reported and verified, NAMA-related actions need to be identified, selected, conceptualized and approved by the government and possibly submitted to the UNFCCC Secretariat to be recorded in the NAMA Registry.

Generally, the process of developing a NAMA can be divided into three phases: conception, implementation and operation.

The conception phase should describe the envisaged measures (*e.g.* policy instruments or technical measures) to overcome barriers to RE deployment, their financing requirements and their respective environmental benefits, as well as co-benefits. Moreover, the Measurement, Reporting and Verification (MRV) process should be identified. Finally, the stakeholders, including local institutions and project developers, should be engaged at the conception stage to provide justification to the NAMA development process.

Based on the NAMA concept study and note, the host country government can move to the implementation stage by creating a supporting legal framework, introducing capacity building initiatives and delineating the implementation strategies and time frames.

Once the NAMA activities have been rolled out (*operation stage*), it is important to administer the NAMA according to the management procedures defined in the conception and implementation phase. In particular, the MRV system should be used to monitor the achievements (emission reductions and co-benefits) of the NAMA while tracking its costs.

### Case Studies: The Role of NAMAs for RE Development in Selected Developing Countries

Three case studies illustrate the potential role of RE NAMAs in countries of varying size and conditions, namely Peru, Kenya and Grenada. The analysis assesses the RE-specific barriers for each country and the role of NAMAs in overcoming them. The key findings are:

- » NAMAs can help achieve broader strategic energy targets, *e.g.* reducing dependence on imported fossil fuels, enhancing security and stability in energy supply, developing human capital and improving overall environmental sustainability;
- » NAMAs are seen as an important instrument that can help overcome institutional, implementation and financing barriers;
- » The UN backed NAMA framework and the involvement of international and national authorities can make investments under a NAMA more attractive;
- » NAMAs serve to scale up the activities of existing economic instruments (*e.g.* Clean Development Mechanism) and access potential new funding sources;
- » NAMAs should ideally include multiple activities that, when combined, create the necessary enabling environment for RE investment. This requires a substantive understanding of current barriers;
- » NAMAs can only become relevant if they are consistent with existing regulatory frameworks and are championed by an important governmental institution. Otherwise, host country ownership will be lacking; and
- » Successful NAMA implementation relies on availability of reliable data for estimation of baseline scenarios and emission reduction as well as on transparent structures and procedures to evaluate achievements.

### Harnessing NAMAs for RET Development

Today, setting up a NAMA is a challenge for all actors involved. There are no precedents in terms of implementation and the framework is evolving rapidly. This Handbook is among the first efforts to provide policy makers and project developers with a comprehensive set of guidelines and case studies that use NAMAs in support of RE deployment. The best practices in this report can help in designing and implementing NAMAs that efficiently achieve global benefits (*i.e.* GHG mitigation) while decreasing or even effectively eliminating the incremental costs of RE deployment. A creatively designed NAMA framework can also be used to gain indirect co-benefits, such as setting up a technology value chain that reduces prices locally while providing employment opportunities, or through NAMA supported capacity building and technology transfer initiatives that ensure a smoother transition towards a green development path.

# 1. Introduction

Nationally Appropriate Mitigation Actions - henceforth known as NAMAs - can be crucial in promoting renewable energy (RE) for electricity generation, particularly in developing countries. This Handbook centres on the future role for NAMAs; developed during the negotiations under the UNFCCC as a planned, voluntary GHG mitigation action for a country that does not have a legally binding emissions commitment. In essence, NAMA notification indicates that a UNFCCC-backed label is assigned to national development activities with mitigation effects. This action can 1) showcase a country's unilateral mitigation activities and/or 2) attract international support for the implementation of such activities via financial, technical or capacity building assistance.

RE has become an integral part of the global power sector with enormous growth rates over the past decade. Global investments in RE rose to USD 257 billion in 2011; compared to just USD 39 billion in 2004 (Renewable Energy Policy Network for the 21st Century (REN21), 2012). Global installed wind capacity reached 238 Gigawatts (GW) in 2011, three times more than only five years before (International Renewable Energy Agency (IRENA), 2012a); installed solar photovoltaics (PV) capacity grew by an impressive 73% in 2011 to reach 70 GW (IRENA, 2012b); and grid-parity (*i.e.* equality of costs of solar power to retail electricity prices) has been attained at various locations. Nevertheless, 75% of the global installed generation capacity is still non-renewable (REN21, 2012), energy use is continuing to grow at a rapid pace, and barriers to a comprehensive RE deployment do exist. If these can be overcome, RE development is likely to continue apace.

The rapid growth of energy demand, particularly in coal-rich Asian countries, has led to a surge in carbon dioxide ($CO_2$) emissions during the last decade. Anthropogenic climate change is driven by a number of GHGs, most relevant among which is $CO_2$; its atmospheric concentration has risen from 280 parts per million (ppm) in pre-industrial years to 400 ppm in 2012. Since 1850, global temperatures have already increased by over 0.7°C; if GHG emissions continue to grow unchecked, they could rise by more than 4°C by the end of this century.

Under the aegis of the UNFCCC, endorsed in 1992, over 190 governments have committed themselves to prevent a dangerous level of climate change. RE can play a key role in mitigating climate change since it allows the combination of further economic growth and increased energy production with a reduction in GHG emissions. This "green growth" path is particularly interesting for developing countries, which can benefit from RE in several ways: RE can be an attractive option to provide access to electricity in rural areas that are currently without grid access. In the long run, RE deployment can also help reduce dependence on fossil fuel imports and demand for foreign currency. Furthermore, the local air pollution that accompanies most fossil fuel uses can be prevented.

NAMAs provide a means to address both climate change and national development strategies by designing public sector interventions that mobilise private participation in low-carbon development and specifically in the expanded use of RE sources.

This Handbook explains the NAMAs as an instrument that can support RE deployment to RE experts and policy makers in developing countries. Chapter 2 introduces the NAMA concept and discusses why NAMAs are of interest. Chapter 3 analyses NAMAs in the context of RE, illustrating typical RE barriers, outlining potential NAMA activities and discussing various instruments and measures to kick-start RE. Chapter 4 provides a guideline for NAMA development that addresses the steps involved in developing NAMA concepts, elaborating them for implementation and operation and finally evaluating their impacts. The Handbook concludes (Chapter 5) with three case studies on the potential role of RE NAMAs in Peru, Kenya and Grenada. These case studies illustrate the barriers to RE within specific country circumstances and how NAMAs can help to overcome them.

# 2. NAMAs and their Importance for RE Deployment

A NAMA is a voluntary activity or set of activities, ranging from implementation of RE pilot projects to entire national development plans covering a wide range of sectors, policies, strategies and programmes. This broad scope is deliberate as policy makers wanted to preclude concentration on specific "fashionable" policy instruments. Through this "low-carbon development" strategy, well-designed NAMAs bring benefits in addition to GHG emission reductions. These co-benefits can include sustainable development effects (*i.e.* economic, social and environmental). Often it is precisely these co-benefits that act as the main driver for the policy labelled "NAMA".

Besides gaining international recognition, the NAMA can harness financial, technical and capacity building support from international partners and donors. This can be part of the USD 30 billion "fast-start finance" agreed at the 2010 Cancun UNFCCC Conference, or part of the USD 100 billion pledged by industrialised countries to be available from 2020 onwards[1].

The only formal requirement for a NAMA is compliance with national development plans and achievement of GHG reductions that could be measured, reported and verified (UNFCCC, 2007)[2]. For example, a country could propose a regulation/standard (*e.g.* a building code requiring integrated PV modules) and implement it as a NAMA. For advanced developing countries, a system of tradable permits or a fossil fuel tax recycled into RE investments could be an option. FiTs or reverse auctions for RE capacity are policy instruments that have shown their ability to mobilise RE rapidly. Information measures, such as capacity building programmes or information campaigns, could serve as a NAMA foundation. Other instruments that could be part of a NAMA include R&D support, electricity labelling and urban planning. In many cases, the NAMA will therefore be a combination of different policies and specific activities implemented as a concerted effort. A NAMA could even be defined as an overall increase of RE deployment or a certain quantitative goal of RE penetration in the long term, without specifying the policy instruments used in detail. However, such an approach risks remaining inefficient and thus is not recommended.

NAMAs entered the climate policy agenda back in 2007 when the Conference of the Parties (COP) to the UNFCCC coined the term as part of the so-called "Bali Action Plan". In late 2011, the 17th session of the COP to the UNFCCC in Durban, South Africa, made a number of important NAMA-related decisions, such as the establishment of a prototype registry, an international Measurement, Reporting and Verification (MRV) process (UNFCCC, 2011a), and further rules for NAMA implementation that are likely to emerge in the coming years. NAMAs will become an important pillar of mitigation attempts if countries can agree on an ambitious future global climate policy regime, especially if significant volumes of climate finance from industrialised countries are channelled through supported NAMAs. It is important to be clear about the nature of support: besides pure financial aid, support can also comprise elements of technology transfer and/or capacity building. Support is envisaged to come from bilateral or multilateral sources. This includes financial mechanisms under the UNFCCC, such as the Global Environment Facility (GEF) or the Green Climate Fund, once the latter is up and running.

NAMAs could also harness revenues from carbon markets if emission reductions under the NAMA generate emission credits. Whether this becomes possible depends on future decisions of international climate negotiations. In this context, one must distinguish between existing and future market mechanisms. The Clean Development Mechanism (CDM) created by the Kyoto Protocol is a good example for the former. The CDM is an economic instrument designed to generate emissions reduction credits and is the most successful of the

[1] *However, it remains unclear how these funds are accounted for (see Stadelmann, Roberts and Michaelowa, 2011; following on directly from Stadelmann, 2011).*

[2] *The general guidelines for domestic MRV of NAMAs are discussed under the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UNFCCC during the course of 2012.*

market mechanisms under the UNFCCC to date. Under the CDM, emission reductions are usually generated by comparing reference levels ("baselines") with project emission scenarios (*i.e.* the situation after a project has started). This can involve comparing a grid energy mix before and after the launch of a wind farm, or the penetration rate of diesel generator sets before and after the introduction of solar water heating systems. Emission credits for the emission reductions are issued by the UNFCCC in a complex process and can then be traded on the carbon market. CDM activities are either realised as stand-alone projects or as Programmes of Activities (PoAs), which allow bundling an unlimited number of similar projects. Today the CDM has resulted in issued emission credits of more than one billion tonnes of $CO_2$ equivalent ($CO_2e$). Potential CDM co-benefits include technology transfer and sustainable development. Text Box 1 lists the key differences between NAMAs as currently defined and the CDM.

The first NAMA concepts were submitted immediately after the Copenhagen Accord (UNFCCC, 2009a) in early 2010. These concepts were very heterogeneous, both in the type of action and the degree of details provided. Since then, more countries have submitted NAMAs to the UNFCCC (see the compilation in UNFCCC, 2011b) and currently many are preparing detailed NAMA proposals. These NAMAs address a broad scope of sectors, such as transport, energy, waste, industry, buildings or agriculture and cover a variety of actions ranging from the design of low-carbon development strategies to plans for introducing certain policies (see Text Boxes 2 and 4) and specific projects (see Text Box 3).

## Unilateral and Supported NAMAs

Two kinds of NAMAs have been defined. Domestically supported NAMAs ("unilateral NAMAs") are those developed with domestic means, while internationally supported NAMAs ("supported NAMAs") are those requiring international support to cover implementation costs. Theoretically, supported NAMAs could receive complementary funding through carbon offset credits generated for the amount of emission reductions

### Box 1

### KEY DIFFERENCES BETWEEN NAMA AND CDM

The concept of a NAMA differs from that of a CDM in a number of ways:

- NAMAs are most likely to be driven by national governments and may be undertaken in partnership with the private sector, whereas CDM projects are typically driven by firms involved directly in the carbon markets.
- NAMAs are more suited to the implementation of policies, strategies and programmes, whereas the CDM is implemented at the project level. A programmatic CDM (PoAs) is closer to the NAMA concept and indeed could provide a starting point for conceptualising a NAMA.
- The CDM has strict rules for testing each project for additionality, (*i.e.* the difference from Business As Usual (BAU)). So far no rules for additionality determination of a NAMA exist; commonly, an assessment of incremental NAMA costs is undertaken.
- CDM projects generally have quite stringent MRV requirements that require demonstration of emissions reductions, whereas NAMA MRV requirements could vary significantly, depending on the nature of the activity and the financing approach.
- NAMAs will not necessarily result in emission credits, whereas the generation of credits is the key purpose of the CDM.

*Source: Regional Centre for Renewable Energy and Energy Efficiency (RCREEE), 2011*

Box 2

## SOUTH AFRICAN RENEWABLES INITIATIVE (SARI)

The SARI is a project developed by the South African Government to scale up power generation from renewable resources (Department of Energy, (DoE), 2011). The initiative is flexible and identifies four different scenarios. The numbers in this text refer to the current (most likely) scenario. The ramp-up of renewable energies should lift RE power production to 19 GW (*i.e.* 9% of electricity supply) by 2025. Compared to the baseline scenario, this would represent an annual emissions reduction of about 27 Mt $CO_2$ (Megatonne of carbon dioxide).

The NAMA is based on an Integrated Resource Plan for Electricity and aims to support the scaling-up of RE in South Africa. The plan, *inter alia*, seeks to increase private sector participation in power generation by developing a framework for Independent Power Producers (IPP) and removing the quasi-monopoly of the public power company Eskom. In this context, the RE IPP Procurement Programme was launched in August 2011 and is scheduled to remain in place until 2014. Furthermore, the electricity tariff is to be further raised and subsidies completely removed. It was first planned to establish a FiT to incentivise RE generation. Now, competitive bidding as an alternative instrument is envisaged.

The investment needed is estimated at USD 36 billion by 2030 with incremental costs of USD 8.0-8.9 billion. The necessary investment should be attracted by a blend of different finance solutions. To leverage sufficient private capital (USD 24 billion), it is estimated that around USD 10 billion low-cost loan solutions, including insurance, are needed. A share of the low-cost loans (USD 3 billion) as well as the residual incremental costs (USD 3 billion) are to be financed by the international community based on a payment by performance as NAMA support.

In addition to the environmental benefit, it is expected that the measures undertaken by the plan will create 35,000-40,000 new jobs. On the other hand, there might be adverse effects on farmers, households and amenity users from the competition for water resources. However, the plan should include safeguards to address these issues.

*Source: South African Renewables Initiative (SARI), 2011*

achieved (often called "NAMA crediting") and be traded on the carbon market[3]. However, the concept of credited NAMAs is not yet officially defined under the UNFCCC. According to the UNFCCC (2011a), NAMA costs should be regarded either as full or incremental costs. While there is no universally accepted definition of these cost concepts, they may be more appropriate for specific mitigation projects than for policies. Full NAMA costs might be differentiated as follows, depending on the activity covered:

- **Investment in a concrete RE project**: The sum of investment costs plus operating and maintenance costs;
- **Research activities**: The sum of costs covering both researchers' time and necessary equipment; and
- **Policy**: Costs for policy design development and administration of the NAMA, including elaboration of the NAMA concept; possibly also costs of the implementation of measures under the policy (*e.g.* costs of capacity building measures, converting equipment or costs of inputs that are different from those used to date).

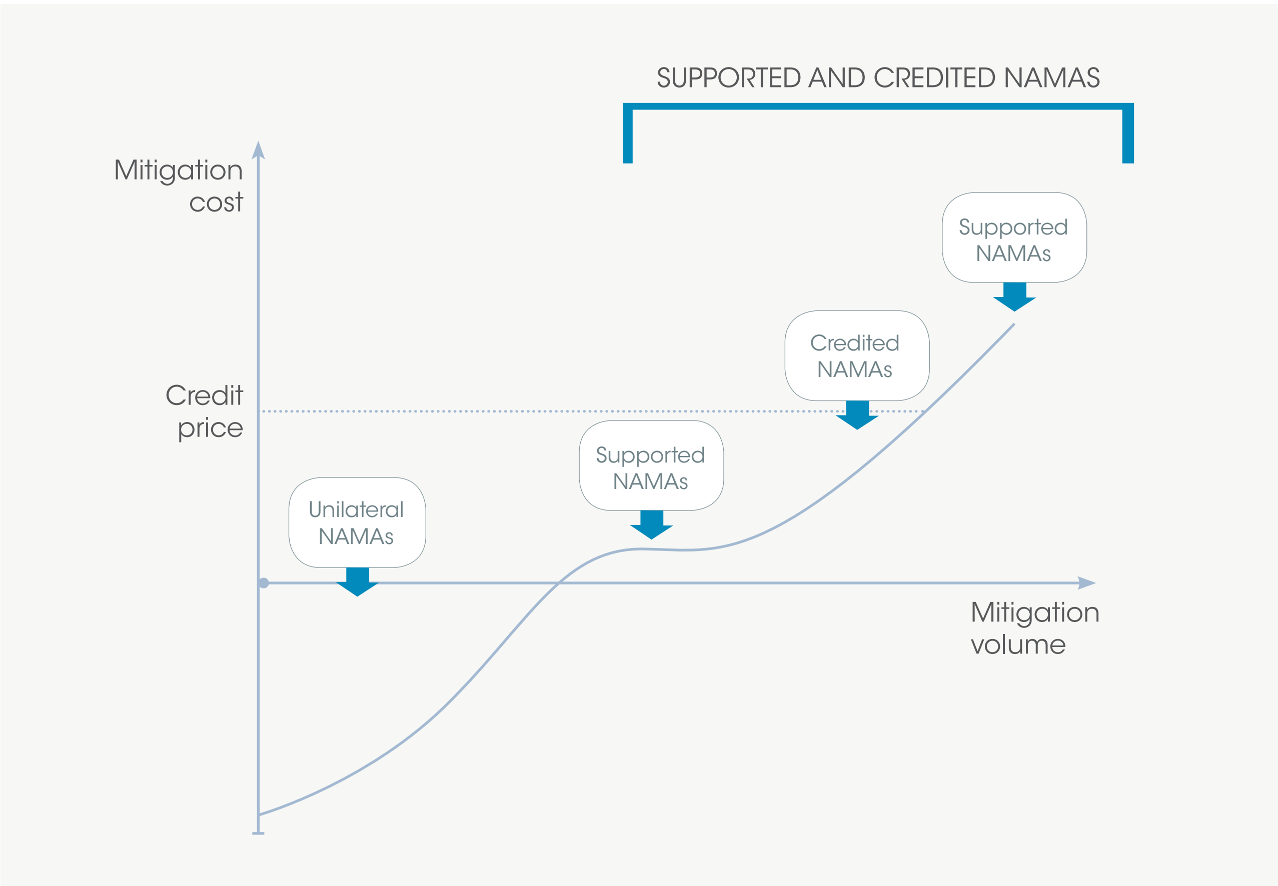
Incremental costs have been defined by the GEF as the differential between costs of a baseline development

[3] *The Cancun Agreements point in this direction, as they define market mechanisms as complementary funding source for NAMAs (UNFCCC, 2010, paragraph 80). In 2011 COP 17 in Durban reiterated this stance (UNFCCC, 2011a, paragraph 83).*

and costs incurred in a project or policy scenario. In other words, incremental costs are "additional costs associated with transforming a project with national benefits into one with global environmental benefits" (GEF, 2011). For instance, to meet the national goal of power generation, a country could choose a more expensive option, which — in addition to local benefits (*e.g.* reduction of air pollution, job creation) — produces global benefits, such as GHG reductions. The difference between the two options is the incremental costs.

A great number of NAMAs proposed to date are looking for support, and the requests have become more elaborate over time (NAMA Database, 2012). It is useful to think about the different NAMA types as "tiers" that can co-exist within the same overall framework or sector of the economy and be applied under various circumstances, particularly with respect to the different levels of GHG abatement costs. Unilateral NAMAs would target the "low hanging fruits" (*i.e.* those emission reductions with negative abatement costs) and allow the developing country to utilise its own low-cost abatement options. Financial support provided by industrialised countries under a supported NAMA could either be targeted at lower positive cost options or at very high-cost options that are not economic for the carbon market to capture. In consequence, and only once they become an official variation of NAMAs, credited NAMAs could harness the emission reduction potential that has positive GHG abatement costs remaining below a carbon credit price. Any support offered by industrialised countries under a supported NAMA would help cover the incremental costs of the policy or action but would not go beyond this limit. Under such a structure, the host country would be required to engage in mitigation action but only to the extent it could afford to do so. Still, the country could envisage mitigation impacts beyond this level by acquiring international support. Figure 1 introduces the different tiers of NAMAs.

Figure 1: Different tiers of NAMAs (theoretical concept)




*Source: Wehner et al., 2012*

## NAMA Registry

The UNFCCC is currently elaborating a NAMA Registry, which will become a voluntary web-based "match-making" platform for developing countries that are proposing NAMAs, international donors and other relevant stakeholders. The Registry will be used by developing countries to attract international support and ensure transparency. Under the NAMA Registry database, governments will be able to submit NAMA proposals in three sections:

- NAMAs seeking international support (either for preparation or implementation), filled in by developing countries;
- NAMAs submitted for recognition (most likely unilateral or already implemented NAMAs), filled in by developing countries; and
- Information from developed countries about NAMA support, filled by these industrialised countries.

For the NAMAs submitted by developing countries, standardised formats are to be used, with different templates for NAMAs seeking support and NAMAs seeking recognition. Industrialised countries are to provide information on the NAMA types they wish to support and on the potential financial resources reserved for NAMA funding. The database is to provide a "match-making algorithm" that will enable an automated matching of NAMAs seeking support and donors wanting to support NAMAs based on criteria, such as technology or sector. The software will automatically inform NAMA proponents about potentially suitable donors.

While the Registry is expected to go online in 2013, the UNFCCC Secretariat has put in place a webpage

### Box 3

### NAMA ON JORDANIAN INDUSTRIAL WASTE WATER TREATMENT

This NAMA consists of the construction of a wastewater treatment plant. It is a pilot project that is currently being implemented and should serve as a blueprint for other NAMAs in this sector, showcasing the functioning of public-private partnerships in sustainable infrastructure projects. The plant is projected to treat 1 million $m^3$ of wastewater annually and produce enough biogas to generate 1.4 GWh of electricity. This will lead to emission reductions of around 13,000 $tCO_2e$ per year.

The private sector is in charge of the technical, corporate and financial design of the project, as well as its operation and maintenance. The public sector provides an appropriate regulatory framework, such as power off-take agreements, RE incentives and infrastructure contributions (*e.g.* grid interconnection or roads).
The project also includes a strong capacity building component. For instance, a workshop was held in Amman to identify possible NAMAs. At the workshop, findings of this process were discussed and the suggested methodology was presented to representatives from Jordan and other Middle East and North African (MENA) countries.

The capital expenditure of the project is USD 13-18 million. On the equity side, a blend of private funding (*i.e.* beneficiary companies and the plant operator) and the Green Climate Fund are envisaged. On the debt side, development banks, export credit agencies, the Green Climate Fund and capital markets are targeted.

Other benefits include improved air quality, reduced use and improved quality of groundwater and avoided waste disposal of organic biomass.

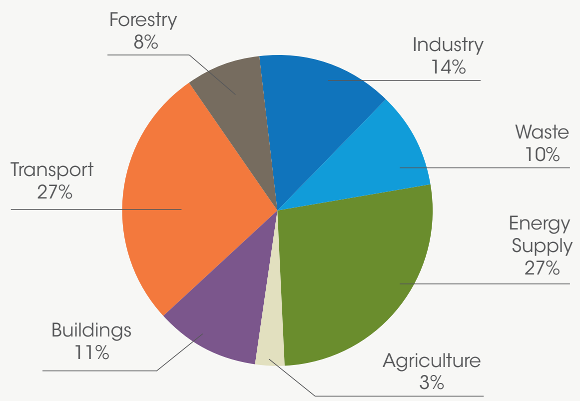
for early submissions to the NAMA Registry prototype. This will enable parties to list NAMAs that seek support for preparation and implementation and to provide information on NAMA support (UNFCCC, 2012a)[4]. It should be noted that the Registry is a voluntary tool and therefore the development of NAMAs, and in particular the interaction with donors, can also take place without the use of this Registry.

While the NAMA Registry does not require a very transparent and comprehensive approach for the NAMA documentation to be uploaded, NAMA coordinators, as well as donor agencies, may want a more detailed dataset, as well as a more transparent understanding of emission reductions achieved by the NAMA. For information included in the NAMA documentation, as well as issues of transparency and MRV, see Chapter 4. Moreover, NAMAs will involve a broad range of public and private, national and international institutions and actors. The role of institutions, donors and stakeholders is also outlined in Chapter 4.

## Overview of the NAMA "Pipeline"

As of September 2012, there were 54 NAMAs in 25 countries at different stages of development in the NAMA "pipeline" (http://nama-database.org), of which 47 were listed as concepts, 4 as proposals and 3 as being in the implementation stage (NAMA Database, 2012). All involved a support component. With respect to the geographical distribution, the majority of NAMAs was based in Latin America (46%) and Africa (42%), while only 12% were located in Asia. Regarding the sectoral distribution, the transport and the energy supply sectors represented the largest shares (27% each), followed by industry (14%), buildings (11%) and waste (10%).

FIGURE 2: SECTORAL DISTRIBUTION OF NAMAS, SEP 2012




More than 75% of all NAMAs are national initiatives (13% sub-national), while almost every second NAMA involves strategies/plans (47%), followed *inter alia* by policies/programmes (20%) and projects (15%).

## Box 4

### GAMBIA ENERGY NAMA

This NAMA includes various measures in the energy sector. It addresses both energy efficiency and energy generation from RE. The NAMA is still in the concept phase, but its plans build on the country's Programme for Accelerated Growth and Employment (PAGE). This general development plan includes a Climate Change Action Plan (CCAP). The NAMA aims to cut emissions from the year 2000 by 10 Mt$CO_2$e, until 2030, which is a 50% reduction.

The NAMA includes energy efficiency measures and two components of RE deployment. It seeks to increase the share of RE in the energy matrix by 20% by 2030. This goal will be achieved by installing small wind turbines with a capacity of 150-200 kW along the coast and by constructing solar PV plants.

Financial support of about USD 120 million is needed. However, a comprehensive financial plan was not publicly available at the time of publication of this study. In addition to the financing need for the implementation of this NAMA, support for the following capacity building activities is required: 1) elaboration of a low-carbon development strategy; 2) analysis of the incremental costs of investments over the period 2012-2030 and beyond; and 3) development of projections for national and sectoral GHG emissions to the year 2030 and beyond.

*Source: NAMA Database (2012)*

[4] *Available at http://unfccc.int/cooperation_support/nama/items/6945.php*

# 3. The Rationale for NAMAs in RE and Discussion of Design Options

## 3.1 BARRIERS IMPACTING THE IMPLEMENTATION OF RE

Since the early 1990s, several countries, driven by concerns over rising oil prices and energy security, began to implement policies for the development of new renewable energy technologies (RETs). These policies aim to remove barriers that prevent their large-scale deployment and to introduce economies of scale. Since RETs have been marketed as an alternative to "fossil energy", most of the barriers relate to the RETs´ "higher costs" compared to conventional forms of energy. Given that costs of conventional energy vary between nations due to different rates of subsidies, taxation, difficulty of access to resources, transport costs etc., the policies for RETs too have been country/region-specific. Table 1 shows a broad classification of the barriers.

Table 1: Barriers impacting RET deployment

| Types of barriers | Challenges |
|---|---|
| Barriers related to costs and pricing | Imperfect market conditions thwart the progress of RE, *e.g.* non-internalization of environmental impacts of fossil based energy often makes RE the costly option and monopolistic energy markets restrict the entrance of small RE producers. |
| | The financial case for RE deployment suffers because of subsidies for fossil fuels. |
| | High up-front investment costs for many capital-intensive RETs reinforced by other non-economic barriers such as lack of technical advancement, scarcity of technology-specific know-how and qualified manpower increases operating costs. |
| | Intensified cost of power production per kWh of non-hydro RETs due to comparatively smaller installed capacity but relatively unchanged transaction costs. |
| | Lack of awareness and insufficient information on RETs and their potentials and benefits among different stakeholders increasing uncertainty and consequently their capital cost through perceived high risks. |
| | Relative lack of readily available and comprehensive data sets for high quality planning. Intermittent nature of RETs (solar and wind) resulting in lack of information (*e.g.* long term plant load factors for a wind site) and difficulties in determining reserve requirements, further increasing the costs. |
| Barriers related to capital access | High up-front capital costs for investors due to the lack of financial instruments related to insufficient financial resources and lending facilities, under-developed capital markets, and unfavourable financial regulation. |
| | Unavailability of adequate financing options also common in countries where national financial institutions lack awareness about RET and therefore associate it with high risk creating an unfavourable investment environment for domestic investors especially. |
| | Limited potential for foreign direct investment (FDI) due to challenges involving risk factors, such as legal security, policy predictability, counter party risk, high-risk premiums on third party finance, constrained access to capital, etc. |
| Barriers related to legal and regulatory framework, including market access | The roles and responsibilities of the specific entities are often poorly defined and are not clearly supported by any specific laws or regulations leading to duplication of work and overlapping of responsibilities. |
| | Traditionally, regulations governing power generation protect monopolistic, centralized and vertically-integrated producers; and make the introduction of RETs difficult. |
| | Ambiguity in grid access connection rules increasing the risk for Independent Power Producers (IPPs). |
| | Lack of consultation between relevant stakeholders to benefit from synergies and complementarity in some countries. |
| | Impeding administrative procedures like planning permits, land use agreements and power purchase agreements or high administrative burdens of obtaining grid access with long delays in obtaining authorization. |
| Barriers related to social and environmental impacts | Excessive land use (solar and wind), and association with direct environmental impacts, such as noise or visual pollution, often resulting in a "not-in-my-backyard" mentality and public resistance. |
| | Potential displacement and resettlement of people as a result of building large dams for hydro. |
| | Associated losses of natural habitats, and natural and human heritage sites. |

Table 2 provides an overview of the range of investment and generation costs of selected RETs, which clearly shows the economic barriers (*e.g.* in comparison to natural gas power plants).

To conclude, barriers can be political, economic, financial, legal, regulatory, technical, institutional and even cultural in nature. Thus, a combination of measures will be required for a cost-effective transfer and diffusion of RETs. However, many of these barriers translate into higher RET costs or risk premiums compared to conventional energy sources. This is why, traditionally, most RET promotion instruments are designed to improve the economic parameters of projects through financial support mechanisms. Removal of political and institutional barriers has been slow in many countries. An internationally viable RE support mechanism may encourage policy makers to accelerate this process.

NAMAs can serve as such a mechanism utilising any form of instrument to support RET development. They can range from sweeping FiT programmes to awareness-raising programmes for citizens' use of renewable electricity to specific "lighthouse projects" financed by governments. The different forms of NAMAs appropriate for RET support are described in Section 3.2.

## 3.2 POSSIBLE INSTRUMENTS AND MEASURES SUITABLE FOR RE NAMAs

### Instruments and Measures to Promote RE

Policy-based NAMAs generally take the form of financial incentives and/or policies that remove non-monetary barriers. The former can be broadly classified (as per Intergovernmental Panel on Climate Change (IPCC), 2011) as follows:

**Non-Market-Based Incentives** are related to governmental budgets. As "carrots", these incentives take the form of grants and tax allowances for potential RET investors to undertake activities/investments that would not have occurred otherwise. As "sticks" or penalties, they take the form of taxes, charges or fees that would be levied on conventional energy. These "sticks" can also take the form of regulations (*e.g.* building codes requiring RET installation). Budget-neutral incentives would require the combination of a "carrot" with a "stick". For example, FiTs financed by a consumer levy would be budget-neutral. While policy "carrots" can lead us towards behaviours that are desirable, "sticks" are designed to "drive" or force us towards desirable behaviours. All such instruments need to be supplemented by awareness creation, capacity building and information dissemination to the appropriate stakeholders.

Table 2: Investment and generation costs of selected RETs

| | Investment costs (USD/kW installed capacity)* | Levelized costs of electricity LCOE (USD/kWh)** |
|---|---|---|
| Hydro | 1,050-8,000 | 0.03-0.20 |
| Solar PV | 3,600-5,000 | 0.11-0.25 |
| Solar CSP (with storage) | 6,300-10,000 | 0.16-0.34 |
| Wind (w/o China and India) | 1,850-2,200 | 0.07-0.14 |
| Geothermal | 2,100-6,100 | 0.07-0.10 |
| Biomass | 2,000-5,000 | 0.08-0.22 |
| Natural Gas (for comparison) | 700-2,000 | 0.06-0.11 |

*Source: *USD/kilowatt installed capacity; IRENA (2012a,b,d,e,f), *REN21 (2012) and **USD/kilowatt-hours; Bloomberg New Energy Finance (BNEF) (2012)*

**Market-Based Incentives** generate incentives through the perception of scarcity, which then generates a price for this "scarce" item. In the context of RETs, the most common forms of market-based incentives are Renewable Energy Certificates (RECs) or mandatory quotas for the purchase of renewable electricity. A special form of market-based incentives are carbon market mechanisms where RET projects generate tradable emission credits or RETs benefit from the fact that utilities using fossil energies have to buy allowances for their GHGs. Such market-based incentives always require regulation.

Non-monetary NAMAs can take the form of mandatory grid access for RET operators, technical assistance to operate the technology and labeling of the power produced by RETs. Table 3 provides a summary of policy-based NAMAs.

## The Suitability of Using Market Mechanisms to Fund NAMAs

How can NAMAs supporting RET be financed? In the case of unilateral NAMAs, the financing comes from within the host country, whereas in the case of supported NAMAs, financing - at least partially - comes from abroad. One special case of NAMA support would be the generation of emission reductions credits[5], *e.g.* through the creation of a new market mechanism under the UNFCCC. Obviously, emission credits would only accrue for reductions that have been monitored and verified, meaning that the country would have to pre-finance the NAMA, entailing a certain risk that the emission reductions planned do not accrue. For many RET-related NAMAs, existing CDM methodologies could be used.

Irrespective of the approach, the NAMA market mechanisms or direct support from industrialised countries aim to generate additional finance. The next section deals with an example of how this financing can be leveraged for the development of RETs.

## An Example of NAMAs as a Financing Mechanism for RETs

As developing countries move towards implementation of a national scheme for the generation of RE, a technology-specific FiT guarantees producers of renewable electricity coverage of the "cost gap" associated with RETs. The FiT needs to be guaranteed over a certain extended period of time to make it financially attractive for investors.

In countries such as Germany, the FiT increases the price of electricity paid by consumers. In developing countries with a lack of purchasing power for a large percentage of the population, resources need to come from other sources. NAMAs have the potential to reduce or even eliminate electricity price increases for consumers while simultaneously providing additional benefits, such as capacity building efforts.

## Using the NAMA Framework for Indirect Financial Benefits

Some governments risk forfeiting revenues in the form of fuel/energy taxes whereas others benefit from a reduction in fossil fuel subsidies. For the former, NAMAs can be creatively used to compensate for such indirect monetary losses. For the latter, NAMAs can help to mobilise the political will to reduce fossil fuel subsidies and might re-orient them towards RE support.

Instead of providing direct financial benefits to RE developers, NAMAs can be used indirectly to increase the scale of financial incentives. In the context of a tradable REC system, the government may increase the price of RECs and the attractiveness of RE by the creation of a "green fund" that buys RECs.

Similarly, support could be granted, not just to RE production, but also to local producers of the underlying RET in order to set up a technology value chain in a country to reduce the price of that technology. The successful set-up of wind power and photovoltaic technology in China due to targeted incentives is a good example.

Given the greater level of control in setting up a MRV system (*e.g.* number of solar cells shipped out of the factory), the NAMA framework could be creatively used to reduce the financial burden while creating a market condition suitable for the development of solar PV systems.

[5] *As discussed in Chapter 2, "NAMA crediting" has yet to be defined by the UNFCCC and hence provides only a hypothetical option that could materialise in the near future.*

Table 3: Policy-based NAMAs

| | NAMA | Definition |
|---|---|---|
| | | **Non-market-based** |
| Fiscal incentives | Grant | Monetary assistance that does not have to be repaid and that is bestowed by a government for specified purposes to an eligible recipient. |
| | Energy production payment | Direct payment from the government per unit of RE production. |
| | Rebate | One-time direct payment from the government to a private party to cover a percentage or specified amount of the investment cost of a RE system or service. |
| | Tax credit (production or investment) | Annual income tax credit based on the amount of money invested in that facility or the amount of energy that it generates during the relevant year. |
| | Tax reduction/exemption | Reduction in tax—including sales, value-added, energy or carbon tax. |
| | Variable or accelerated depreciation | Allows for reduction in income tax burden in first years of operation of RE equipment. |
| Public Finance | Investment | Financing provided in return for an equity ownership interest in a RE company or project. |
| | Guarantee | Risk-sharing mechanism aimed at mobilizing domestic lending from commercial banks for RE companies and projects that have high perceived credit (*i.e.* repayment) risk. |
| | Loan | Financing provided to a RE company or project in return for a debt (*i.e.* repayment) obligation. |
| | Public procurement | Public entities preferentially purchase RE services (such as electricity) and/or RE equipment. |
| Regulations | Renewable Portfolio Standard/Quota obligation or mandate | Obliges designated parties (generators, suppliers, consumers) to meet minimum (often gradually increasing) RE targets. |
| | Tendering/Bidding | Public authorities organize tenders for given quota of RE supplies or supply capacities, and remunerate winning bids at prices mostly above standard market levels. |
| | Fixed payment FIT | Guarantees RE supplies with priority access and dispatch, and sets a fixed price varying by technology per unit delivered during a specified number of years. |
| | Premium payment FIT | Guarantees RE supplies an additional payment on top of their energy market price or end-use value. |
| | Net metering (also net billing) | Allows a two-way flow of electricity between the electricity distribution grid and customers with their own generation. |
| | Priority or guaranteed access to network | Provides RE supplies with unhindered access to established energy networks. |
| | Priority dispatch | Mandates that RE supplies are integrated into energy systems before supplies from other sources. |
| | | **Market-based** |
| Regulations | RECs | Tradable Certificates, need to be based on regulation defining a RET obligation such as a Renewables Portfolio Standards (RPS). |
| | Carbon trading | Fossil energy producers need to surrender GHG emission allowances, increasing the competitive position of RET. |
| | Carbon offsets | RET projects generate GHG emission credits that can be sold on the market. |
| | Green energy purchasing | Regulates the supply of voluntary RE purchases by consumers, beyond existing RE obligations. |
| | Green labelling | Government-sponsored labelling (there are also some private sector labels) that guarantees that energy products meet certain sustainability criteria to facilitate voluntary green energy purchasing. Some governments require labelling on consumer bills, with full disclosure of the energy mix (or share of RE). |
| | | **Other instruments** |
| | Public support for RE R&D | RET development in public labs. |
| | Technology diffusion and capacity building | Training programmes. |
| | International networks/cooperation | Organization of conferences to learn from experiences of RET pioneers. |

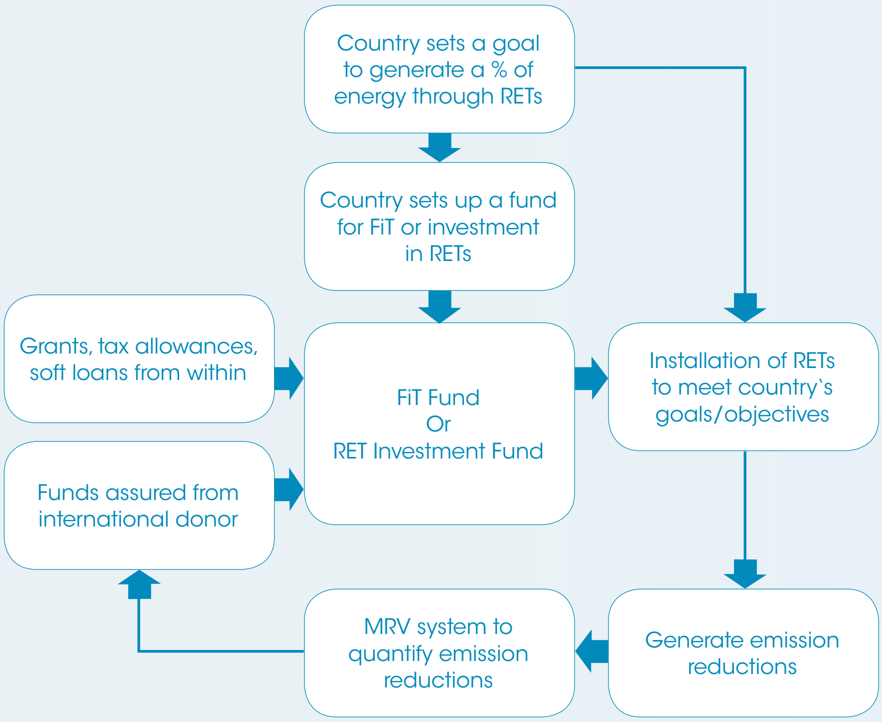
*Source: Includes IPCC, 2011, p. 890,*

Box 5

## NAMAs AS A DIRECT FINANCING INSTRUMENT FOR RET

Consider the fictitious country "Namarica" that wishes to create supportive enabling environment for the development of RETs. For this purpose, "Namarica" sets up a "FiT/RET investment fund" to assure private investors a pool of money available to pay for the FiT over a given period of time. Part of these funds can be provided through the country's internal finances, while the rest is a "green loan" under a supported component of the NAMA. A bilateral agreement can be signed between "Namarica" and a donor country that specifies the conditions for the loan to be provided. This financial contribution can then be channelled back into the fund or the specific project based on the actual emission reduction generated. The donor country can specify the MRV system, in agreement with "Namarica", to ensure that the emission reductions generated fulfil the donor's policy and institutional requirements.

FIGURE 3: NAMA AS A FINANCING INSTRUMENT FOR RET




## Incentivising Capacity Building and Technology Transfer for NAMAs

Building capacity for local policy development, implementation and evaluation activities is essential to increase the effectiveness of NAMAs, as well as to provide donors with the confidence that NAMAs achieve their emissions mitigation objectives. Capacity building efforts for RE policies supported by development agencies, non-profit organizations and other funds that can serve as blueprints for NAMA support have been in existence for several years. For example, Germany supported the development of China's country-wide FiT through technical assistance, while Denmark was critical in bringing wind turbine technology and testing facilities to India. Indian and Chinese technology providers are actively engaged in bringing their technology to South Africa under the SARI Initiative (see Text Box 2).

# 4. Providing Best Practices and Processes for NAMA Launching

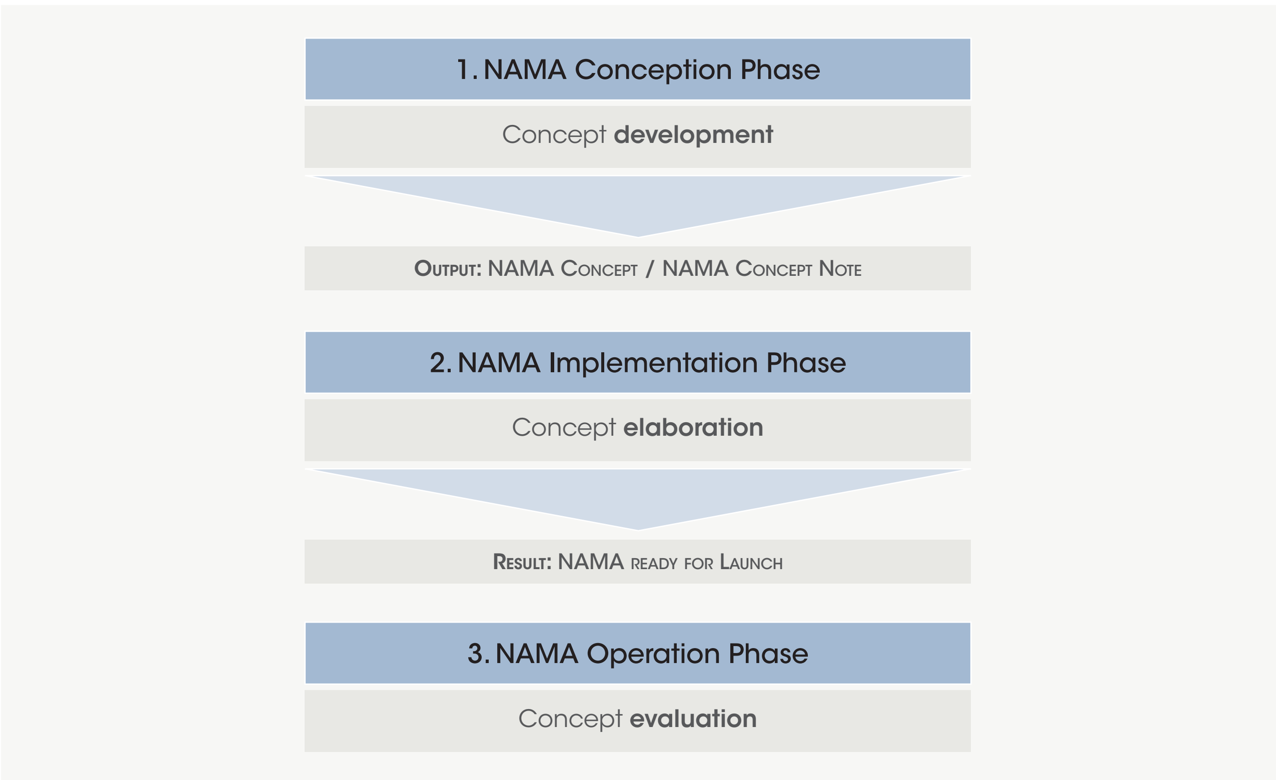
There is a stark difference between putting forward a certain NAMA idea, such as the announcement of a FiT for RE, and taking concrete steps towards practical implementation of the NAMA, such as convincing the Ministry of Finance to earmark a budget to cover the costs of the FiT. The latter is a much more challenging enterprise.

The development of a NAMA can be divided into three phases: the conception phase, the implementation phase and the operation phase (Figure 4). The subsequent chapters discuss the most important aspects of practical NAMA development, namely conceptualising, implementing and operating a NAMA. The focus is clearly on the conception phase, as this lays the foundation for the NAMA.

## Defining the NAMA Idea and Scope

In general, the objective of a NAMA is the reduction of GHG emissions in a certain sector/area, while at the same time allowing for growth and development. The identification of RE NAMAs should ideally be done through an in-depth analysis of the domestic RE potential as well as options to trigger mitigation activities for the most promising alternatives. In the first place, a screening of existing/planned policies lays the foundation for the later scope of the NAMA: what sort of activities are still required to reach the objectives underlying the NAMA concept and what has already been done. Hence, before a NAMA concept can be elaborated, a scoping and identification process has to be conducted. Often countries have already gathered

Figure 4: Three-tiered NAMA development



information on low carbon/emission development strategies, which serve as a good foundation to carve out the NAMA scope. Furthermore, the coordinating entity for the NAMA ("NAMA coordinator", see description below) should understand the barriers for certain policies and conduct an assessment on how to overcome them through the NAMA. In general, information to be gathered should cover:

- A range of policies, programmes or project activities that reduce emissions and are aligned with national development plans;
- Existing or planned relevant domestic policies;
- Baseline establishment and future mitigation scenarios;
- Potential barriers preventing the implementation of these policies;
- Required resources and solutions to obtain these resources; and
- Potential co-benefits beyond pure GHG emissions reductions.

It should be noted that the NAMA initiative need not come from the host country government but can be started by domestic or international actors (*e.g.* public sector, private sector, development agencies and multilateral donor agencies).

The low carbon/emission development strategies process supported by the World Bank and the U.S. Department of Energy could be applied to the development of NAMAs (Energy Sector Management Assistance Program (ESMAP), 2009; Low Emission Development Strategies (LEDS) Gateway, 2012)[6]. An interesting resource for policies that could inform NAMA concepts is the International Energy Agency (IEA)/IRENA database for RE policies and measures (IEA, 2012)[7].

## NAMA Development Process

In order to implement a NAMA and measure, report and verify its mitigation effects, actions with NAMA potential need to be identified, selected, conceptualised and approved by the government and possibly submitted to the UNFCCC Secretariat for listing in the NAMA Registry. Generally, the process of developing a NAMA can be divided into three phases: conception, implementation and operation, as illustrated in Figure 4[8]. While the conception phase covers the development of the NAMA from the initial idea to a comprehensive concept study, the implementation phase starts with the translation of the concept into practice (*i.e.* adaptation of the ideas to political, economic, social and technical realities). Once the NAMA is implemented and launched, the operation phase begins, in which the NAMA is conducted and evaluated. Since NAMAs mainly represent domestic policies, one should consider the usual lead and implementation time spans for related policies in the host country. Hence, the time required for converting a NAMA idea into practice can be significant. This is even more the case if international support comes into play, as this may make the process more complex.

NAMAs are an instrument developed under the UNFCCC. Thus, parties can use the UNFCCC NAMA Registry to share their progress with other parties and observers, as well as donors by uploading respective NAMA documentation to the UNFCCC Registry.

## Who is Involved?

As in all complex policy development processes, the responsibilities for the NAMA elaboration need to be clearly delineated. Ideally, the whole process would be coordinated and administered by a "NAMA coordinator". Governments can set up NAMAs in a centralised manner (*e.g.* under a central NAMA office) or in a decentralised manner (*e.g.* individual NAMA development chaired by certain agencies). Hence, the coordinator can either be a public authority or an institution, such as an inter-ministerial NAMA office or a unit in the Ministry of Environment. Furthermore, a private entity can steer the NAMA development under the auspices of the host country government. The NAMA coordinator would be officially mandated to initiate and administer the NAMA development process, reporting on it to the government. The tasks of the coordinator may range from the administration of the NAMA conception and implementation to the MRV architecture, the development of the documentation, the coordination of involved public and

6 *The experiences in six large developing countries are available at: http://sdwebx.worldbank.org/climatportalb/doc/ESMAP/KnowledgeProducts/Low_Carbon_Growth_Country_Studies_Getting_Started.pdf; U.S. experiences can be found at: http://en.openei.org/wiki/Gateway:Low_Emission_Development_Strategies.*

7 *Available at: http://www.iea.org/policiesandmeasures/renewableenergy/*

8 *Note that, as of October 2012, only three NAMAs have reached the implementation phase while none has started its operation yet.*

private institutions, stakeholders and technical experts or the interaction with the UNFCCC and donors.

Besides the NAMA coordinator, the process of developing a NAMA will involve a plethora of governmental, public and international actors. Depending on the design of the envisaged NAMA, they would need to be involved in one way or the other. Furthermore, according to the choice of activities covered by the NAMA and their respective designs, various stakeholders may be positively or negatively affected through the implementation of the NAMA. These would have a natural interest in the activities of setting up a NAMA and thus should be involved in the NAMA development from the first stages. In order to justify the NAMA and its activities, it is important to involve all stakeholders. Hence, identification of the relevant stakeholders should build on existing initiatives. If required, identification could take place through both top-down (*i.e.* via public and private communication channels) and bottom-up (*i.e.* public calls for inputs and participation) processes. Depending on the scope of the NAMA, stakeholders would typically represent a broad range of the society. A non-exhaustive list of stakeholders under a NAMA is listed in Table 4[9]:

## 4.1 NAMA CONCEPTION PHASE

Today setting up a NAMA is a challenge for all actors involved. There are no precedents and the framework is evolving rapidly. There is a generic understanding of NAMA elements and purposes; however, there is only limited UNFCCC guidance about how standards for NAMA development can be framed; in particular with regards to the NAMA documentation of the concept, estimated emission reductions and the MRV system and support framework. Naturally, the NAMA conception phase has to compile a broad range of information that usually results in a comprehensive NAMA documentation. Ideally, this process would be documented in a NAMA Concept Note, as well as in a more comprehensive NAMA Concept Study.

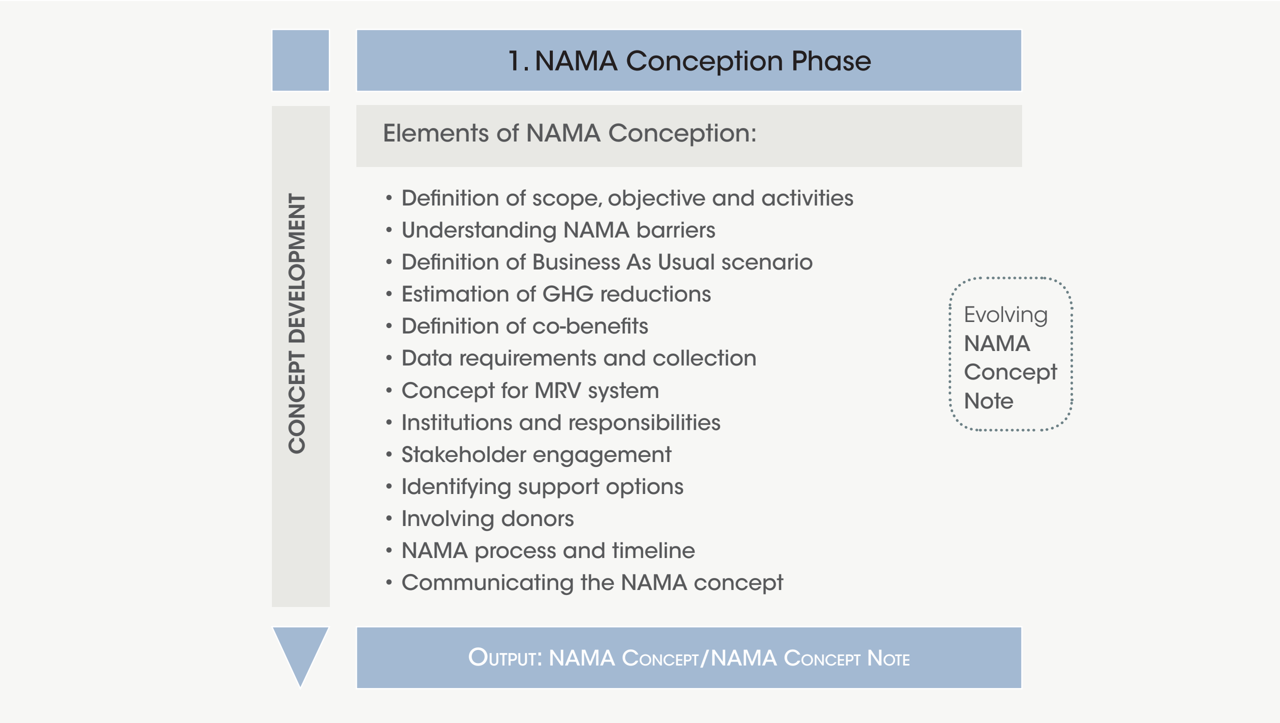
Figure 5 illustrates components of the NAMA conception phase. Before the concept can be elaborated, the NAMA coordinator needs to be clear about 1) the objectives of the NAMA and 2) the scope of existing and planned national policies. As described above, for NAMA scoping, the initiating entity (*e.g.* governmental, public or private sector, domestic or international) should have a comprehensive overview of existing policies and measures that could be labelled as a NAMA,

Table 4: Possible stakeholders involved in NAMAs

| | |
|---|---|
| **Governmental** | Ministries responsible for regulation of the proposed policies and/or measures |
| | Energy regulators |
| | Sub-national governments (state and local governments) |
| **Public sector** | Public utilities (central/state/municipal) |
| | Public banks or investment promotion agencies |
| **Private sector** | Industry associations and chambers of commerce |
| | Key industrial companies |
| | Private utilities |
| | Private banks |
| | Other business with relevant interests in the NAMA measures |
| **Non-Government Organizations and civil society** | Non-Government Organizations from various areas |
| | Civil society representatives (*e.g.* indigenous or religious groups) |
| | Political parties |
| **Supporting institutions** | Domestic or multilateral development banks |
| | International development agencies |
| | Observers from regional institutions or partner countries |
| **Research and academia** | Universities and research institutions |
| | Think-tanks |
| | Technical experts and advisers |

9 *Based on United Nations Development Programme (2010)*

Figure 5: NAMA conception phase




particularly in the energy sector. Furthermore, envisaged plans for low carbon development and untapped potential for RET deployment need to be understood, so that the initial idea for RE NAMAs can be developed. The identification of the regulatory/policy environment can involve various players.

The Concept Note outlines the NAMA idea in a condensed fashion and provides the key NAMA messages and concepts, such as scope and objective, potential measures and their respective status, an initial implementation schedule as well as an assessment of potential stakeholders to be engaged. A short description of the envisaged measures (*e.g.* policy instruments or technical measures), their respective environmental benefits and co-benefits, financing of activities and MRV processes, should be included. The NAMA Concept Study is the background document and the repository of information for this particular NAMA. Hence, it includes more technical details and covers a broader scope.

As of the publication of this report, no universally endorsed template for a concept study had been produced. It is therefore important that the content complies with the recommendations of the UNFCCC, as well as the requirements of potential donors. With respect to NAMA Concept Notes, numerous formats, templates and standards have been released by various NAMA stakeholders since 2011. In mid-2012, the UNFCCC published templates for NAMA concept notes that help preparation and implementation (UNFCCC, 2012a)[10]. That is the template used in this Handbook. Table 5 provides an illustrative example for a NAMA Concept Note.

As shown in the fictitious NAMA concept note (see Table 5), the following elements are crucial for the NAMA concept:

**Definition of NAMA Scope, Objective and Activities.** Once the NAMA "niches" have been identified, the scope of the NAMA can be framed. It is important to understand the NAMA's GHG mitigation potential, the respective abatement costs, the feasibility of MRV actions, the relation to national policies and the co-benefits. Key questions are:

» What is the envisaged outcome of the NAMA (*i.e.* mitigation and co-benefits)?

[10] *Templates are available online at: http://unfccc.int/cooperation_support/nama/items/6945.php.*

Table 5: Fictitious example of NAMA Concept Note

| NAMA Concept Note | |
|---|---|
| Party | Namarica |
| Title of mitigation action | FiT for RE in Namarica |
| Sector | Energy Supply |
| Technology | Bioenergy, solar energy, wind energy, geothermal energy |
| Type of action | National/sectoral policy or programme |
| NAMA coordinator | Ministry of Energy of Namarica |
| Relevant stakeholders | Private sector – power utilities, industry, contractors, suppliers |
| Description of mitigation action | Increased share of power generated from renewable sources resulting in decreased use of thermal generated electricity |
| Type of emissions | $CO_2$ |
| Current status | Initial discussions within Ministry have occurred |
| Expected start year of implementation | Law to be passed in 2013, enforcement to begin in 2015 |
| Number of years for completion | 10 years |
| Cost of preparation of the NAMA | USD 50,000 |
| Estimated full cost of implementation | USD 10,000,000 |
| Estimated incremental cost of implementation | USD 7,500,000 |
| Amount of support required | USD 6,000,000 |
| Type of required financial support | Loan: USD 3,000,000<br>Grant: USD 500,000<br>Guarantee: USD 1,500,000 |
| Amount of technological support | USD 1,000,000 |
| Amount of required capacity building | 800 person-hours |
| Type of required capacity building | Systemic (policies, legislative, regulatory) |
| Estimated emission reduction | 42,000 $MtCO_2e$/yr |
| Other indicators of implementation | Generation capacity added, renewable power produced, number of jobs created |
| Benefits for local sustainable development | Improved energy security, job creation in RE sector, decreased local air pollution |

*(Based on UNFCCC, 2012a)*

» Which target group is involved (*e.g.* a certain sector/industry/area/boundary)?

» What are the activities that could lead to the defined objective?

The answers to these questions will provide a clearer picture of the potential NAMA and its boundaries.

**Understanding Barriers.** RET programmes face various barriers that are political, economic, financial, legal, regulatory, technical, institutional and even cultural in nature. NAMAs can integrate the required measures and steps to overcome these barriers. A clear barrier assessment needs to be undertaken in order to understand where NAMAs can be engaged and to what degree support is required (see below). A comprehensive overview to identify barriers for technology diffusion is provided in a GEF/United Nations Environment Programme (UNEP) guidebook (UNEP Risoe, 2012d)[11]. A definition of how barriers can be assessed on a project level is available in specific CDM guidelines (UNFCCC, 2009b)[12].

**Definition of the Business As Usual Scenario.** To evaluate a NAMA's environmental benefits, it is essential to understand the baseline scenario; that is, the emissions that would have occurred in the absence of the NAMA action, also called the "BAU" scenario. This baseline is

[11] *See http://www.tech-action.org/Guidebooks/TNA_Guidebook_OvercomingBarriersTechTransfer.pdf.*

[12] *http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid38.pdf.*

crucial when it comes to calculating GHG emission reductions. The BAU definition for the energy sector is a complex exercise with substantial differences between countries, depending on their energy pricing, energy resources available, projected economic development, etc. The BAU scenario must project current emissions within the NAMA scope over the envisaged lifetime of the programme. In case no BAU scenarios are available at the national level (*i.e.* their development has not yet been conducted by the government), the NAMA coordinator may either initiate a BAU assessment for the respective sectors or rely on external sources.

The Organisation for Economic Co-operation and Development (OECD) provides a discussion of national and sectoral baseline setting (Prag and Clapp, 2011)[13]. Generally, the BAU definition will be based on modelling; hence one should check for available energy models (see for instance the ESMAP Energy Forecasting Framework and Emissions Consensus Tool (EFFECT) (ESMAP 2012a)[14]). If modelling is not regarded as a viable option, the broad set of CDM baseline methodologies and tools, especially those relating to the power sector (UNFCCC, 2012b)[15], may be considered. Note that CDM methodologies mainly follow a single project approach and hence may not be appropriate to assess baselines of broad policies and measures introduced under a NAMA. However, on-going standardisation efforts may make CDM methodologies much more appropriate for baseline setting under NAMAs.

**Definition of Estimated Emission Reductions.** A NAMA's mitigation effect is measured by the difference between the baseline emissions and the level of emissions under the NAMA. As described above, the baseline emissions would be estimated as per the applied baseline methodology, whereas the measurement of actual emissions of all actions implemented/emitters covered under the NAMA constitutes the NAMA emissions level. It is recommended to apply an emission calculation approach that is consistent with the baseline scenario. Note that the precision of the emission reduction determination will depend on how direct the effects of the NAMA activity are. Similar to the case of baseline determination, the variety of CDM methodologies can provide good indications to estimate emission reductions under a RET NAMA (UNFCCC, 2012b)[16].

**Definition of Co-benefits.** Besides the pure abatement effects, NAMAs may generate co-benefits. These will most likely include sustainable development benefits, such as benefits to the economy (*e.g.* an increased number of jobs), environment (*e.g.* reduction in water consumption) and population (*e.g.* reduction of indoor smoke from fossil-fuelled cook stoves). Specific impact assessments should be conducted (see for example the European Sustainability Network (European Sustainable Development Network (ESDN), 2007)[17] or an OECD discussion on impact assessments (OECD, 2010)[18]).

**Data Requirement and Collection.** The NAMA development will require a huge amount of data, including the scoping exercise, the baseline setting, the calculation of NAMA emissions, and the required abatement and implementation costs. The availability of data may determine which NAMA options are feasible and which are not. This is particularly true for internationally supported NAMAs with international MRV components. Unilateral NAMAs will need to provide data for biennial update reporting under the UNFCCC. For RE-related NAMAs, information, such as IRENA country profiles, and overviews, such as REN21 (2012), are helpful.

**Developing a Concept for MRV Systems.** In general, the MRV system for a NAMA should be practical rather than impose a burden or a barrier to the NAMA's implementation. The attractiveness of the overall NAMA will correlate with its feasibility and complexity. Activities with "simple" MRV conditions are more likely to be implemented and to receive funding. A practical approach in this context would be using CDM methodologies as a starting point. The MRV system should allow for more flexibility and simplicity than the current approaches under the CDM, but to date the exact level of stringency, data intensiveness and degree of external verification remain unclear and undefined under the UNFCCC. Also, the MRV requirements for NAMAs will differ between supported and unilateral NAMAs.

» For supported NAMAs, the MRV stringency will depend on requirements at UNFCCC level, as well as the specific requirements of donors;

» The UN rules for biennial reports determine minimum requirements on NAMAs reporting;

13 *See www.oecd.org/environment/climatechange/47857020.pdf.*
14 *Available at www.esmap.org/esmap/EFFECT.*
15 *http://cdm.unfccc.int/methodologies/index.html.*
16 *http://cdm.unfccc.int/methodologies/index.html.*
17 *www.sd-network.eu/?k=quarterly%20reports&report_id=5.*
18 *www.oecd.org/greengrowth/48305527.pdf.*

- Existing domestic practices for reporting to the UNFCCC should be reflected in NAMA reporting;
- The NAMA Registry does not require any specific MRV;
- Domestically funded, unilateral NAMAs should allow for flexibility and cost-efficiency in terms of MRV; and
- CDM monitoring methodologies can serve as possible starting points for MRV design, but they must be adapted to the specific needs of the NAMA (*e.g.* standardisation of baselines, use of benchmarks and more practical sampling approaches).

For a good overview of MRV, relevant parameters should be compiled into a MRV plan. To facilitate the process of monitoring and recording of information, the MRV plan should entail:

- Frequency of measurement and reporting of parameters;
- Responsibilities of involved actors concerning MRV;
- Assumptions/default values applied and the respective sources;
- Sources of parameters monitored;
- Description of data processing; and
- Calculation method of emissions reductions, including measures to avoid double counting among NAMAs of the same host country.

Further reading on MRV for NAMAs is available at UNEP Risoe (UNEP Risoe, 2011)[19] and on the website of the International Partnership on Mitigation and MRV (International Partnership on Mitigation and MRV, 2012)[20].

**Identifying Institutions and Responsibilities.** The NAMA coordinator should clearly define the roles of all actors involved in the NAMA conception phase. A NAMA management structure would comprise the following aspects:

- Overview of the NAMA management structure;
- Description of involved entities;
- Description of roles and responsibilities of involved entities;
- Outline of the decision-making process; and
- Definition of expertise required (technical or institutional) for each position.

**Forging Stakeholder Engagement.** As described above, stakeholder engagement should play a decisive role throughout the process of NAMA development. Ideally, stakeholders would be more strongly involved in the early stages of preparing a NAMA when crucial issues require the stakeholders´ attention. Later in the process, stakeholders should be kept informed, ideally also when the NAMA is being implemented.

A handbook for stakeholder engagement in developing countries (from a business perspective) has been provided by the International Finance Corporation (IFC, 2007)[21]. A stakeholder analysis toolkit is available from the Overseas Development Institute (ODI, 2009)[22].

**Identifying Support Options.** As discussed above, putting forward a RE NAMA may face various challenges. Support to overcome these can come in the form of financial or technical support or capacity building. A thorough assessment should be undertaken to identify those measures that can be implemented domestically and those requiring external support. This assessment should be included in the NAMA concept documentation in order to facilitate support planning.

Allocating specific costs to individual measures under a NAMA may become challenging, in particular when it comes to estimating incremental costs for specific actions. Nevertheless, transparent cost estimation will likely be expected by both domestic and international investors, and donors. NAMA costs need to be identified, carefully calculated and substantiated with credible data.

To estimate the financial support requirements of NAMA activities, the costs of related projects that have already been undertaken can be taken into account.

[19] *www.uneprisoe.org/upload/unep%20ris%C3%B8/pdf%20files/unep%20ris%C3%B8%20mrv%20nama%20primer.pdf.*
[20] *www.mitigationpartnership.net/.*
[21] *www.ifc.org/ifcext/enviro.nsf/attachmentsbytitle/p_stakeholderengagement_full/$file/ifc_stakeholderengagement.pdf.*
[22] *www.odi.org.uk/resources/details.asp?id=5257&title=stakeholder-analysis.*

Here the United Nations Development Programme (UNDP) methodology for national assessments of investment and financial flows (UNDP Climate Community, 2012)[23] can provide a good understanding of costs for activities in a variety of sectors. Another useful tool for cost estimates is the marginal abatement costs tool of ESMAP (ESMAP, 2012b)[24]. Furthermore, a comprehensive discussion of financing options for mitigation activities is provided in a GEF/UNEP guidebook (Limaye and Zhu, 2012)[25].

Information for conducting technology needs assessments has been provided by the UNFCCC in its Technology Needs Assessment (TNA) Handbook (UNDP, 2010)[26], while TNAs and Technology Action Plans are being published by the UNEP TNA project (UNEP Risoe, 2012c)[27].

**Involving Donors.** As described above, NAMA finance will come from public domestic sources in the first instance. The authorities administering these funds need to be contacted to identify NAMA funding possibilities. If a financing gap arises at the domestic level, international donors can be approached. An interesting resource to identify financiers is the joint World Bank/UNDP online tool, "Climate Finance Options" (World Bank, 2012)[28].

**Defining the NAMA Process and Timeline.** The NAMA coordinator should define the process from the initial NAMA idea to the individual activities in the operation phase. Also, the envisaged NAMA lifetime, the estimated conception time, roll-out and; if applicable; a periodic approach for the operation should be illustrated.

**Communicating the NAMA Concept.** The NAMA concept may be uploaded to, or updated in, the UNFCCC NAMA Registry, once this facility has become operational. This will permit "marketing" the NAMA, particularly regarding required support (UNFCCC, 2012a)[29].

## 4.2 NAMA IMPLEMENTATION PHASE

Based on the NAMA concept study and note, the host country government (as long as it is concerned) can now decide whether to move the NAMA from conceptual stage into implementation. Certain parameters and conditions may have changed during the development of the NAMA concept. Hence, the information may require adjustments before the NAMA can be implemented. Further steps now will also be required to enable the implementation process within the host country. Figure 6 illustrates the NAMA implementation phase.

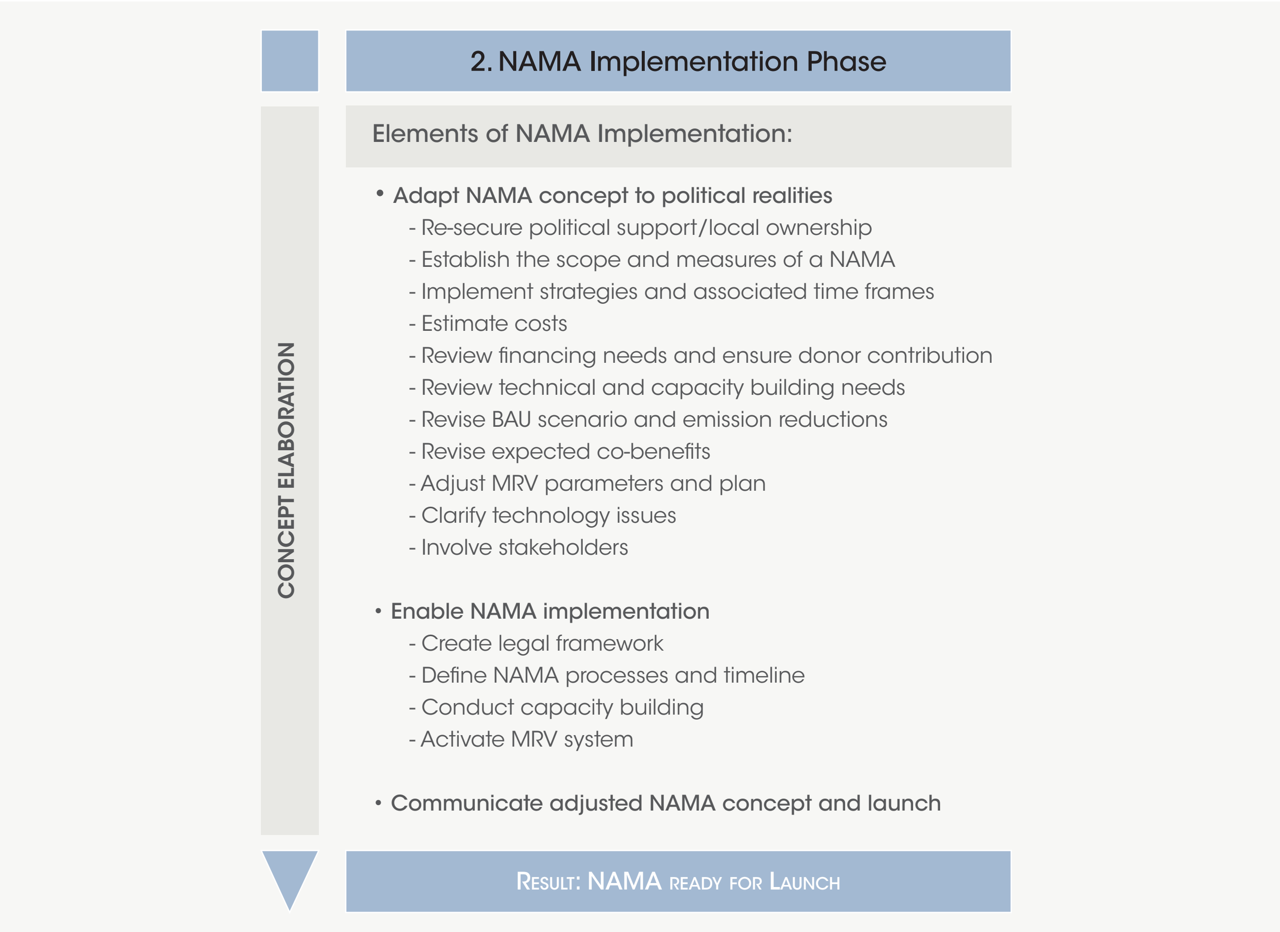
**Adapting the NAMA Concept to Political Realities.** The closer and the more serious the policy implementation gets, the more dynamic the stakeholder (including government) interest will become. The government or other relevant actors may require the NAMA coordinator to revise and adjust the NAMA for implementation, including changes in national/international policy frameworks or the NAMA objectives. This can comprise various aspects, such as:

- Re-securing political support/local ownership;
- Revision of the scope and measures included in the NAMA;
- Revision of the envisaged implementation strategies and associated time frames;
- Revision of the estimation of costs (including incremental costs and barriers);
- Review of financing needs and ensuring donor contributions;
- Review of technical and capacity building needs;
- Revision of the BAU scenario and expected emission reductions;
- Reassessment of expected co-benefits;
- Adjustment of MRV parameters and plan;
- Clarification of technology issues; and
- Involvement of stakeholders to understand their position and ensure commitment.

Hence, the NAMA coordinator should prepare to revise the NAMA concept, realising that it may now depart considerably from the original design. Adjusting the NAMA concept for implementation is likely to be time consuming, and a close interaction with the relevant governmental

[23] *www.undpcc.org/en/financial-analysis.*
[24] *www.esmap.org/esmap/MACTool.*
[25] *http://tech-action.org/Guidebooks/TNA_Guidebook_MitigationFinancing.pdf.*
[26] *http://unfccc.int/ttclear/pdf/TNA%20HANDBOOK%20EN%2020101115.pdf.*
[27] *on http://tech-action.org/.*
[28] *www.climatefinanceoptions.org/cfo/index.php.*
[29] *See http://unfccc.int/cooperation_support/nama/items/6945.php for the pilot system.*

Figure 6: NAMA Implementation Phase




actors and other stakeholders will be required (for instance, through a stakeholder working group).

A UNEP reference manual for sustainable policy implementation provides an interesting reflection in this context (UNEP, 2009)[30].

**Enabling NAMA Implementation.** In order to enable a smooth implementation of the NAMA, specific steps are required, ranging from sweeping changes in key legislation to granting governmental approvals/permits for individual projects. Initially, a legislative/regulatory process needs to be started. If no prior legislation exists in the area of RE, a generic enabling policy framework might be required. In any case, a review of similar policies and laws introduced elsewhere will be useful. The NAMA coordinator needs to appreciate the amount of time required for the relevant framework to be implemented, as well as all the legal processes, the actors involved and the potential risks and challenges of the process.

Regarding the set-up of the NAMA management, it is now also time to identify and train the personnel and human resources that allow for a smooth processing of NAMA activities. These capacity building initiatives may require international partners (*e.g.* development agencies or multilateral organizations, such as the GEF or the World Bank).

Furthermore, it will be important to implement the MRV system; that is, to ensure that the monitoring and reporting procedures are ready for launch and that the verification process will work.
The OECD discusses success factors for enabling frameworks in connection with "green growth" in developing countries (OECD, 2012)[31].

**Communicating an Adapted NAMA Concept.** Eventually, the re-worked NAMA concept will be ready for launch. The NAMA documentation should be updated and uploaded to the NAMA Registry. All stakeholders will be informed regarding the envisaged launch.

[30] *www.unep.ch/etb/publications/IPSD%20manual/UNEP%20IPSD%20final.pdf.*

[31] *www.oecd.org/dac/environmentanddevelopment/50559116.pdf.*

## 4.3 NAMA OPERATION PHASE

Once the NAMA has been launched — that is, the legislation has been completed and the policies/measures are operating — it is important to administer the NAMA according to the management procedures defined in the NAMA conception and implementation phase, in particular the MRV system. In order to learn from the NAMA experiences right from the start, an evaluation process should be initiated. Figure 7 illustrates the NAMA operation phase.

With the launch of the NAMA operation; it is of highest importance to operate the MRV system. The MRV of the NAMA impacts would comprise the monitoring of emission reductions and co-benefits according to the monitoring plans, and the reporting to the national and international (*e.g.* UNFCCC, donor) authorities. The verification of the NAMA can be conducted by an independent verification entity, depending on the degree of support either by a team of international experts under the International Consultation and Analysis or by domestic auditors.

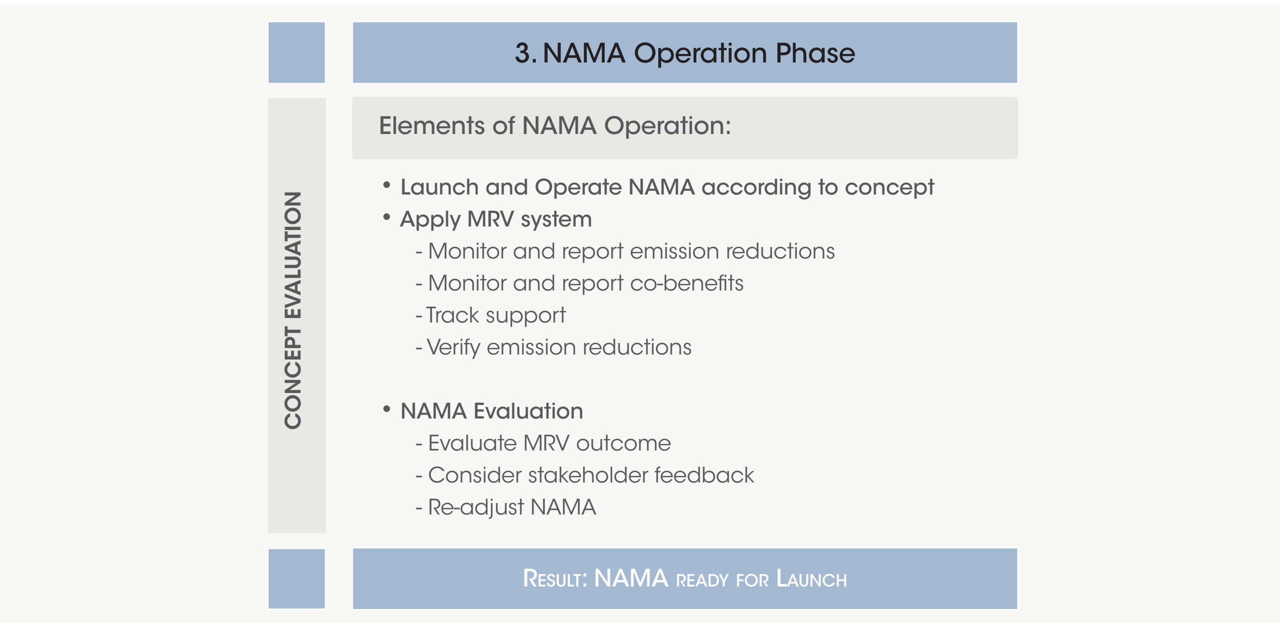
Regarding the tracking of financial and technical support and capacity building, governmental reporting procedures and financial management systems should be considered, as well as donor reporting requirements as agreed with the host country. Donor and government spending could be combined into one report and submitted as part of the biennial update report.

For technical support measures, dates for the start of construction and commissioning (and any periods, if applicable) should be recorded, as well as details (*e.g.* capacity, technology provider) about the technology being applied. Specific parameters (*e.g.* energy reduction, energy production, and technology costs) need to be reported.

Regarding capacity building measures information (*e.g.* the date, topic and number of involved participants) should be made transparent. Any sort of guidance documents and their purpose need to be reported.

**Evaluating the NAMA Effects and Impacts.** The MRV outcome will determine whether the NAMA is fulfilling its objectives or whether certain aspects of it need to be revised. Therefore, the NAMA coordinator should carefully evaluate the data from the MRV process regarding the envisaged and real impacts, invite feedback from all stakeholders, experts and donors, and adjust the NAMA concept accordingly. This adjustment may require substantial efforts to vitalize the NAMA in practice. This may *inter alia* affect the baseline calculation, the estimated emission reductions or the cost estimates. Further capacity building measures may be required. Also, a need for further financial and technical support could arise. Since the International Consultation and Analysis process is scheduled every two years, the evaluation could be aligned with this time frame.

Figure 7: NAMA Operation Phase



# 5. Case Studies: The Potential Role of RE-Supported NAMAs in Selected Developing Countries

The RET potential and the possible role of NAMAs for three developing countries - Peru, Kenya and Grenada - is presented in the following case studies.

## 5.1 CASE STUDY: PERU

NAMAs can play an important role in helping to overcome institutional, economic and technology-related barriers to RE generation in Peru.

Peru's NAMA submission to the UNFCCC includes the goal of producing at least 40% of the total energy consumed in the country using RE by the year 2021. The Government has requested the GEF to support the design and implementation of RE-specific NAMAs. Generic lessons from these two exercises that are applicable to other countries include:

» NAMAs should help to achieve broader strategic energy targets, *e.g.* reducing dependence on imported fossil fuels, enhancing security and stability in energy supply, developing human capital and improving overall environmental sustainability.

» NAMAs should ideally include multiple activities that, when combined, create the necessary enabling environment for RE investment. This requires a substantive understanding of current barriers.

» NAMAs need to be forward-looking regarding the future baseline energy profile and be based on solid projections and on reliable data for the current energy situation.

» The responsibility for NAMAs implementation should reside in one government agency/ministry, not spread across multiple institutions.

» NAMAs must be consistent with the current national regulatory framework.

» NAMAs should scale-up current CDM/PoA and voluntary carbon activities and access potential new funding sources, which, so far, have been elusive.

### Peru and NAMAs

Since the emergence of the NAMA concept, Peru has clearly expressed willingness to participate in the development and implementation of voluntary mitigation actions. Key sectors for the development of NAMAs are: RE and energy efficiency, bioenergy, solid waste management, sustainable low carbon housing, construction materials and sustainable transport.

In regard to the energy sector, Peru has already presented the UNFCCC Secretariat with its intention to implement NAMAs to achieve the following voluntary target: "modification of the national energy matrix so that in the year 2021 renewable energy represents at least 40% of the total energy consumed in the country". This modification would imply:

- Reduction in the consumption of fossil fuels through the combined use of RE (*i.e.* hydro, solar, wind, biomass, tidal and geothermal) and increased energy efficiency;

- Reduction by approximately 28% of GHGs in the energy sector compared to the year 2000 (*i.e.* ≈ 7 $MtCO_2e$).

Firstly, Peru (*i.e.* the Ministry of the Environment (MINAM) as the national focal point of the UNFCCC and the Ministry of Energy and Mines (MINEM)) has asked for financial and capacity building assistance, starting with a request to the GEF to support the design and implementation of NAMAs in the energy sector to achieve the RE voluntary target described above. The GEF approved the elaboration of a feasibility study for such NAMAs in June 2012.

Secondly, Peru has been selected to be part of the project "Mitigation Momentum" financed by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). This project will help design a NAMA related to waste-to-energy projects in the agricultural sector.

Finally, the Nordic Partnership Initiative will provide the necessary assistance required to design a solid waste NAMA, exploring and addressing gaps in data availability and quality for sectoral GHG emissions, technical and institutional capacity, as well as potential barriers in implementing the scaling-up of GHG mitigation actions in this sector. Moreover, the initiative will assess the potential of biogas production and waste-to-energy initiatives in at least 31 Peruvian cities.

In order to first gain an understanding of the energy situation in Peru, a national energy profile is presented.

## Energy Profile: Peru

### Current Situation

The energy sector is the second largest source of GHG emissions in Peru, after the Land-Use, Land-Use Change and Forestry (LULUCF) sector, with over 20% of the country's total GHG emissions. The current national installed capacity is 40% hydro and 60% thermal (*i.e.* a total of 8,613 MW; (Megawatt)), plus a tiny wind power plant. During 2010, almost 36 TWh (Terawatt-hours) of electricity were produced; 56% by hydroelectric power stations and 44% by thermal power stations. The national electrification rate is almost 85%, with an electricity access rate of 95% in urban areas and 63% in rural areas.

### Future Energy Profile

The Peruvian Government plans to provide 85% of rural homes with access to electricity by 2021 (MINEM, 2011b). The IRENA country profile for Peru indicates a "high" potential for wind, solar, hydro and geothermal, a "high-medium" potential for biomass, and an "unknown" potential for ocean-based RETs (IRENA, 2012c).

Based on gross domestic product (GDP) forecasts and plans for broader access to electricity, it is estimated that the demand will reach approximately 80 TWh by 2030. According to a baseline electricity supply scenario up to 2030 developed by the World Bank, gas-fuelled power stations will provide the greatest share of the electricity (ESMAP, 2010). A Peruvian-Brazilian energy agreement envisages construction of hydropower plants with a 6 GW capacity, but a major electricity generation share is expected to be exported to Brazil (Inter Press Service (IPS), 2012). The projections for the second National Communication estimate that emissions from the energy sector will almost triple in a 50-year period (2000-2050).

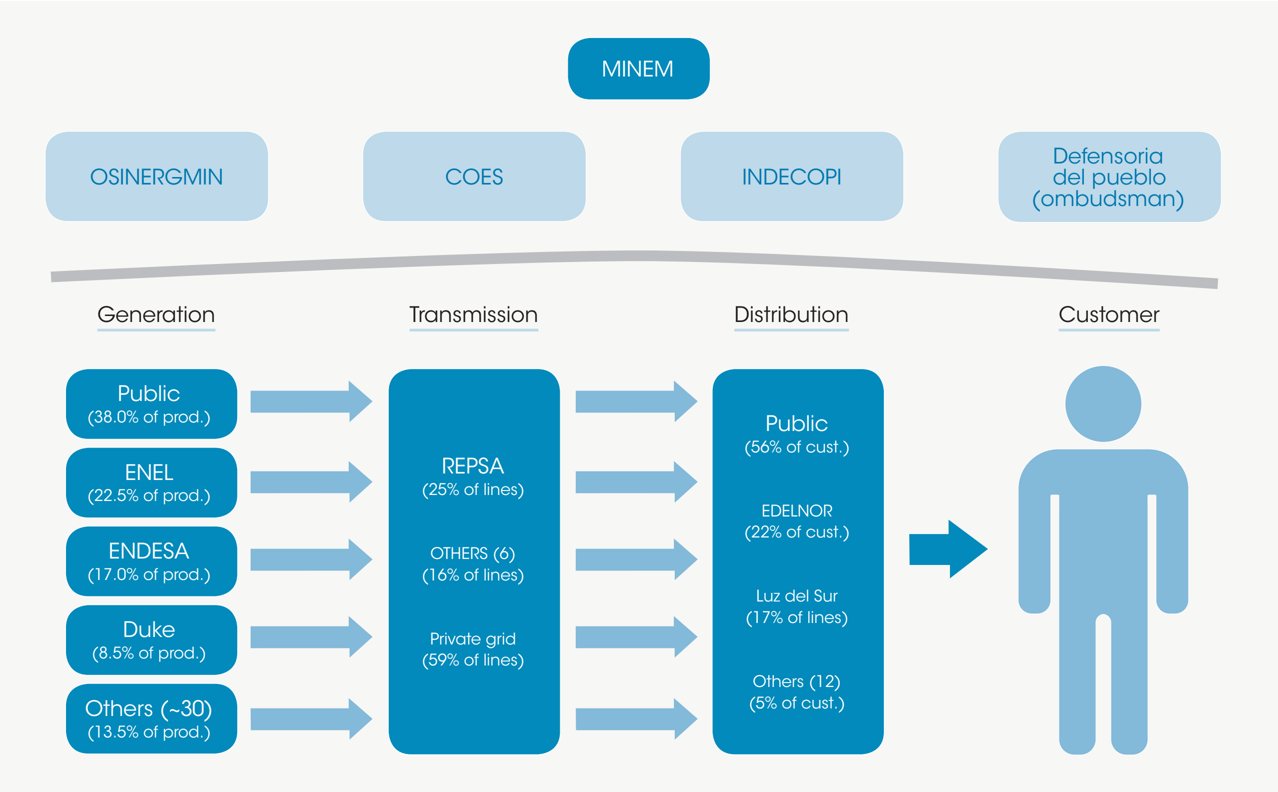
## Institutional Framework: Energy

The Peruvian MINEM is responsible for the national energy policy and the design of policy instruments for the mining and energy sectors. Furthermore, the following entities have regulatory roles:

- The Supervisory Organism of Investment in Energy and Mines (OSINERGMIN) determines the reference electricity price and enforces market players' compliance with the concessions.

- The System Economic Operation Committees (COES) is the technical entity in charge of the long-term strategy for the electricity grid and administers the short-term electricity market.

Figure 8: Structure of the electricity market in Peru




*Source: MINEM, 2011a&2011c*

- The National Institute for Defence of Competition and the Protection of Intellectual Property and the National Civil Defence Institute (INDECOPI) ensures market competition and defends both consumers' and the general population's rights.

All three segments of electricity supply (*i.e.* generation, transmission and distribution) are liberalised in Peru. However, publicly owned companies still play an important role in electricity generation and distribution. The markets are oligopolies, dominated by a small number of companies.

The institutional framework is depicted in Figure 8.

All these stakeholders would need to be involved in an eventual RET NAMA in Peru.

## Institutional Framework: Climate Change

In addition to the energy institutional framework, the Peruvian climate change institutional framework must be taken into consideration. Peru currently operates as a decentralised government and thus devolves responsibilities to the sub-national levels. In a parallel process, it also modernises the regulations of the State's central role. The current national environmental authority in Peru and the UNFCCC Focal Point is the MINAM which has a Bureau for Climate Change, Desertification and Water Resources that is the Designated National Authority of the CDM. The MINAM heads the National Commission for Climate Change (CNCC) that was created in 1993 with the responsibility to coordinate the implementation of procedures for complying with UNFCCC in different sectors and to design and promote the National Strategy for Climate Change. The MINAM has contributed to strengthening environmental institutionalisation, assuming responsibilities assigned to the former National Environmental Council, expanding the role of the State and raising the level and importance of the environmental sector in the government. Both the National Environmental Council and the MINAM have carried out climate change programmes and projects in coordination with other key government institutions for climate change management (*e.g.* the MIMEM, Foreign Affairs, Economy and Finance, Production, Agriculture, Transportation and Communications, Health, the National Science and Technology Council and the National Civil Defence Institute).

## Governmental RET Regulation and Policy

In 2008, a law promoting investment in electricity generation with RE sources (D.L. 1002) was adopted. It declares the use of RE, defined as biomass, wind, solar geothermal and tidal energy, as well as hydroelectric facilities with an installed capacity below 20 MW, as a national interest and a public necessity. The law states that OSINERGMIN will provide preferential treatment for RE projects when tendering for additional capacity.

The bylaw for the generation of electricity with RE (D.S. N° 050-2008-EM), also approved in 2008, establishes the regulation for the RE tendering process by OSINERGMIN and includes incentives for RE, principally:

- Priority for the dispatch of electricity and access to the transmission and distribution network;
- Long-term stable tariffs established through bidding; and
- Guaranteed purchase of the total electricity produced.

In 2010, the Peru National Energy Policy for the period 2010-2040 (D.S. N°064-2010-EM) was approved. Two of the principal objectives are support for a diversified energy matrix with emphasis on renewable sources of energy and energy efficiency and development of an energy sector with minimal environmental impact and low carbon emissions in the framework of sustainable development. In 2011 the Government of Peru approved the National Plan for Environmental Action 2011-2021 (D.S. N° 014-2011-MINAM). This Plan may have an indirect effect on RET development as it stipulates reaching a 1:1 ratio between the growth in GHG emissions and the growth in GDP in 2012. By 2017 the target is to reduce this ratio below 1:1, and to further reduce this ratio by 2020 from that registered in 2017.

## Financing Options for Renewable Energy Projects

Financing for RE currently comes from several sources: the Government of Peru, the CDM, national incentives, international funding sources and national private funding. A more detailed description of these options follows.

### Clean Development Mechanism

To date, Peru is host to 30 (22 in the RE sector) registered projects and 34 (29 in RE) projects that are at the validation stage. A broad range of RE technologies has been registered under the CDM, the majority of them for hydroelectric power generation. Moreover, six RE CDM projects have already issued Certified Emission Reductions. Regarding CDM PoAs, three run-of-river (RoR) activities are in the pipeline, one of which is being registered.

TABLE 6: CDM PROJECTS IN PERU ACCORDING TO THEIR STAGE AND GENERATION CAPACITY

| | Technology | Projects registered | Projects at validation | Total (MW) | |
|---|---|---|---|---|---|
| Standard CDM | Bagasse | | 1 | - | 35 |
| | Other biomass | | 1 | - | 2 |
| | Geothermal | 2 | 2 | 83 | 280 |
| | Hydro (dam) | 5 | 0 | 307 | - |
| | Landfill power | 1 | 0 | 6 | - |
| | Hydro (RoR) | 14 | 20 | 504 | 888 |
| | Solar | 2 | 1 | 40 | 16 |
| | Wind | 0 | 4 | - | 232 |
| PoAs | Hydro (RoR) | 0 | 3 | - | 30 |

Registered | At validation

*Source: UNEP Risoe, 2012a&b*

So far, 80 projects have obtained Letter of Approval from MINAM as the Peruvian Designated National Authority.

Given the current situation on the carbon market with low credit prices and EU import restrictions for credits from projects not located in Least Developed Countries, the demand for new project credits in Peru will be limited and CDM is unlikely to be a main financing option from 2013 onwards. However, this technical knowledge and understanding of mitigation activities gathered by the private and public sector through concrete project experiences and the capacity development programmes executed in Peru during the last ten years[32] will serve as a stepping stone for new market mechanisms, including the exploration of credited NAMAs and sectoral mechanisms.

### International Funding Sources

There are several international institutions providing finance for the development and implementation of projects/programmes in the Peruvian energy sector, including the IFC, Banco Bilbao Vizcaya Argentaria (BBVA Bank), Corporación Financierade Desarrollo S.A. (COFIDE), Development Bank of Latin America (CAF), the GEF, UNDP and the Inter-American Development Bank.

Some of the institutions listed above might be interested in providing partial funding (*e.g.* grants or loans) for the development of RE and energy efficiency projects under a NAMA framework.

### National Private Funding

Four local Peruvians banks have funded projects under the first RE tender: Scotiabank; Banco Interamericano de Finanzas (BIF); Interbank; and HSBC (Hong-kong and Shanghai Banking Corporation).

Peru has limited experience with financing RE investments. Nonetheless, Renewable Energy Resources (RER) tenders were recently successfully implemented by MINEM. It would be worth exploring the possible role of national private funding institutions in potential RET NAMAs.

## Challenges to RE Deployment

Even though Peru already has a significant amount of RE, especially hydropower, many institutional and implementation challenges for RE generation still exist. These barriers are usually general (*i.e.* for wind, hydro, geothermal and biomass) but some are also sector-specific (*e.g.* solar energy).

### Institutional Challenges

- » The government and businesses prefer abundant national natural gas resources. For example, gas-powered plants have been given preference to hydropower plants through the use of tax incentives over the past few years.
- » For hydro, the Environmental Impact Assessment can represent a significant hurdle.
- » In the special case of biofuels, the sustainability risks are high.
- » For geothermal, feasibility studies, technical knowledge and a comprehensive legal framework are lacking.

### Implementation Challenges

- » Longer construction times are required for RE power plants (*e.g.* 4-5 years in the case of hydropower, compared to 1.5 years for natural gas).
- » Less electricity is generated than was planned, *e.g.* existing dams lost storage capacity more rapidly than calculated due to the accumulation of sediment. There is also the risk of changing rainfall patterns.
- » In the case of wind, the electricity grid (missing 500 kV (kilovolts) lines at the coast) is not dense enough and the price premium for wind in auctions requires clarification.
- » Renewable energies have higher investment costs compared to gas power plants.

Two RER auction processes were realised by the OSINERGMIN between 2009 and 2011. The first RER auction for a total of 1 GW awarded power contracts to 18 hydroelectric projects (*i.e.* fewer than 20 MW), four solar PV projects, three wind projects and two biomass projects. The total capacity covered from this auction was 429 MW, generating 1,972 GWh/year (gigawatt hours/year). The second RER auction, for a total of 1,981 GWh/year, awarded power contracts to seven hydroelectric

[32] *i.e. World Bank Carbon Finance – Assist Programme (CF-Assist); UNEP Capacity Development 4 Clean Development Mechanism (CD4CDM); Japan International Cooperation Agency (JICA); and UNDP Carbon 2012 (UNDP project towards a low-carbon development).*

projects (*i.e.* fewer than 20 MW), one solar PV, one wind project and one biomass project. Total capacity covered was 210 MW, generating of 1,153 GWh/year. A third RER auction is scheduled to take place during 2013. The targeted total energy generation and installed capacity was not reached to date because the maximum price set by OSINERGMIN was too low. The target could have been reached if all bidders who offered prices above the maximum prices had been awarded a contract. See Table 7, which shows the results of the RE tenders implemented in Peru.

## Overcoming Challenges to RE Deployment: The Case for NAMAs

NAMAs can help overcome barriers and challenges in two key ways: by providing support to overcome institutional challenges and by facilitating projects/ programmes implementing policies and regulations. Further details on how this can be achieved in the case of RE follow.

### Overcoming Institutional Challenges

On the regulatory side, the first priority must be the improved integration of RE, both in the National Mitigation Plan, where RE is just a subset of energy efficiency, and in the National Energy Matrix (Stadelmann and Eschmann, 2011).

The regulatory bodies may also try to enhance the competition within the electricity market, where an oligopoly of three companies generating 60% of the power exists. More transparent and market-enabling grid regulations are needed. Grid extension, coordinated with the expansion of wind and solar power, is an important task for the regulating authority System Economic Operation Committees (Mutschier, 2009).

### Overcoming Implementation Challenges

Both grid expansion and RE power promotion (*e.g.* wind, solar, biomass) would require substantial new funding, as well as the appropriate incentives from the Peruvian Government to the private sector. An instrument to guarantee fixed prices for RE is especially needed, either via the existing RE auctioning process, by making general auctions more accessible for renewables or by establishing FiT. A stop-and-go policy with large but time-limited auctions must be avoided. Furthermore, the use of multilateral credit lines could be considered because Peru, as an emerging country with comparably low risks, is attractive to lenders. It would also be advantageous to train credit executives and officials to identify opportunities for sustainable energy financing and to assess RE projects for financing, in order to strengthen the financial sector's interest in RE (Stadelmann and Eschmann, 2011).

## Designing and Implementing RE NAMA in Peru: Lessons Learnt

Some of the lessons learnt so far that can be applied to the development of NAMAs in Peru (*e.g.* GEF NAMAs

TABLE 7: GENERATION COSTS, DEPLOYMENT SCENARIOS AND POTENTIAL OF RE

| Technology | Cost* (USD/kWh) | Contracted in tender (MW) | | Reference plan (MW in 2019) | Potential (MW) | |
|---|---|---|---|---|---|---|
| | | 1st tender | 2nd tender | | by 2020 | feasible |
| Cogeneration | 0.052 | 23 | | - | 1.8 | N/A |
| Waste | 0.110 | 4 | 2 | - | - | - |
| Wind | 0.072 | 142 | 90 | 190 (additional) | 1.8 | >22,000 |
| Solar PV | 0.120 | 80 | 16 | | 540 | 4-6 kWh/m²/ day |
| Geothermal | - | - | - | - | - | 1,000-3,000 |
| Small Hydro (<20 MW) | 0.055 | 180 | 102 | 4,241 | 2 | 2 |
| Large Hydro | - | - | - | | - | 35 |

*Sources: IFC (2011); Stadelmann and Eschmann (2011); MINEM (2011c); OSINERGMIN (2012a); OSINERGMIN (2012b).*

* *The cost is the price at which electricity was offered under the RE tender .*

in the energy generation and end-use sectors) and elsewhere are presented in the next section.

### NAMA Submissions to the UNFCCC

Initial voluntary mitigation targets need to be refined. Peru has officially presented a RE NAMA expansion plan proposal to the UNFCCC Secretariat aimed at modifying the national energy matrix by 2021. This would involve approximately 28% GHG reductions in the energy sector compared to 2000. One lesson learnt is that countries can benefit from the development of NAMAs, not only to reduce GHG emissions, but also to achieve broader strategic energy targets (*e.g.* avoiding dependence on fossil fuels, enhancing security and stability in energy supply, developing human capital and improving overall environmental sustainability).

### Concrete Projects and Programme Development

Implementation instruments need to be designed and then used effectively to reach the targets. The Government of Peru requested support from the GEF for the design and implementation of concrete projects, policies and programmes in both the energy generation and end-use sectors to achieve the country-related RE voluntary targets described previously. Another key lesson learnt is that a NAMA should ideally include a set of activities that, when combined, create the necessary enabling environment for investment to implement the required technology, thereby achieving the NAMA goal. The table below illustrates a possible set of activities for selected NAMA goals in Peru (although it may also be applicable to other countries).

### Consideration of Present and Future Energy Profiles

Most NAMA project submissions aim to reduce GHG emissions below BAU by 2020. Therefore, it is of the highest importance to consider, not only the present, but also the future energy profiles, as in the case of the planned GEF NAMA in Peru, as well as others (*e.g.* bio-energy NAMA, waste-to-energy NAMA). The baseline to calculate mitigation achieved by the NAMA has not yet been internationally agreed upon.

### Alignment to Institutional and Regulatory Framework

Full coordination with all relevant national and international stakeholders is required. In the case of Peru, the GEF NAMA proposal will be executed by the MINAM and the MINEM.

One general recommendation is that the NAMA implementing process should not be spread over more than one government agency/ministry, as this can lead to unclear responsibilities and internal conflict over the management of funds.

The need for alignment with the regulatory framework is also a key lesson learnt from the Peruvian case study where several laws, policies and plans exist that promote investment in electricity generation with RE sources.

### Financing

There are several RE initiatives in Peru receiving financing through the revenue of carbon credits under CDM/voluntary carbon market schemes. Therefore, it would be worth exploring the possibility of developing NAMAs by scaling-up on-going activities (*e.g.* CDM/PoA, Verified Carbon Standard, Gold Standard). NAMAs can generate entirely new financial flows, but the framework has yet to be clearly defined. None of Peru's NAMA initiatives to date has received the relevant allocation of financial resources to actually invest in RE. As in most developing countries, all NAMA

Table 8: NAMA set of activities to achieve the Peruvian RE goal

| Sector/Sub-sector | NAMA Aim | Technology(-ies) | Policy(-ies) | Support programmes |
|---|---|---|---|---|
| Power Generation | RET support | - Wind power | - FiT | - Improve planning and permitting process |
| | | - Solar Photovoltaic | - Renewable portfolio standards | - Grid Code |
| | | - Biomass | - RET certificates | - Granting priority to RET |
| | | - Waste-to-energy | | |

initiatives remain at the stage of feasibility studies or capacity building support.

### Overcoming Institutional and Implementation Challenges

Through funding, technology and capacity building support, NAMAs provide an opportunity to identify and overcome the barriers associated with RE. Therefore, a comprehensive barrier analysis for mitigation options in the energy generation and end-use sectors needs to be developed.

In this sense, the Planning for Climate Change Project (PlanCC) has been designed by public, private and non-governmental institutions under the leadership of a Steering Committee (presided over by the Peruvian Ministry of Environment and integrated by the Ministry of Economy and Finance, the Ministry of Foreign Affairs and the National Centre for Strategic Planning) to collect sound information on possible climate change mitigation scenarios in Peru, including energy generation and the end-use sector, and to strengthen capacities and lay foundations for long-term, low-carbon economic growth.

In the case of Peru, it has been illustrated how some institutional challenges (*e.g.* through a transparent grid regulation) and implementation challenges (*e.g.* through the establishment of an instrument to guarantee fixed prices for RE) can be overcome.

MINAM has developed a proposal to establish a national GHG inventory system. It is currently exploring the design of a GHG management platform to overcome double-counting, as well as laying the foundations for MRV.

#### Other Key Lessons Learnt

Mitigation actions must be built on a solid foundation based on reliable information, well-established baselines and accurate projections. This will necessitate the establishment of a national and regional GHG inventory system for the energy generation and end-use sectors that allows the definition of baselines and the MRV process.

## 5.2 CASE STUDY: KENYA

Although emissions per capita in Kenya are low, they are increasing as the country develops rapidly. Emissions from the energy sector rank third, after agriculture and primary emissions from livestock, and have increased by 50% in the last decade (Stockholm Environment Institute (SEI), 2009). At the same time, carbon intensity from electricity has decreased, which demonstrates that there is potential for emissions reductions in the energy sector, at least on an intensity basis. NAMAs in the electricity sector can build on this experience.

Although the majority of Kenya's electricity is currently generated by RE (*i.e.* mainly large-scale hydropower and geothermal), many barriers to RE still exist, including: insufficient/inadequate data; lack of adherence to system standards by suppliers exacerbated by poor after-sales service; limited capacity for equipment acquisition/supply; human resources constraints; high resource risks; RE resource distribution relative to existing grid/load centres; climate change impact; high capital costs; challenges in reaching financial closure; lack of appropriate and affordable credit and financing mechanisms; the high cost of resource assessment and feasibility studies; and limited awareness about the opportunities for RE in Kenya.

The role NAMAs can play in helping to overcome these barriers has been recognised by the Government of Kenya and NAMAs comprise a sub-component of the National CCAP, which is currently under development. Work undertaken so far on this sub-component has resulted in the following lessons learnt:

- Identifying individual actions may not be the best approach, particularly in countries where there is significant overlap between ministries or devolution of competencies to local governments. Therefore, it may be more appropriate to apply a sectoral approach for NAMA development.
- Understanding for, and ownership of, the NAMAs would be greater if the prioritisation was done by those directly involved, particularly the Government of Kenya, which is the primary stakeholder.
- Working under a government-approved framework (*e.g.* the CCAP) is crucial to ensure the relevance of NAMA development.

## Kenya and NAMAs

In view of the increased level of awareness that the threats of climate change pose for Kenya, the Government of Kenya launched a National Climate Change Response Strategy in 2010. Recognising the need for concrete actions to implement the National Climate Change Response Strategy, the Government of Kenya embarked on a comprehensive process to develop a holistic action plan to implement the National Climate Change Response Strategy (Ministry of Environment and Mineral Resources of Kenya, 2012a; the Ministry of Environment and Mineral Resources of Kenya, 2012b). This plan, called the Kenya CCAP, is expected to be completed by the end of 2012. It comprises eight components encompassing various climate change aspects. Sub-component-4 relates to NAMAs. Further information about lessons learnt from the development of sub-component-4 follow.

Kenyan emissions per capita are increasing as the country undergoes a rapid development phase. Emissions from energy sector rank third, after agriculture and livestock, and are estimated to have increased by 50% in the last decade (SEI, 2009). The majority of Kenya's population relies on biomass to satisfy its energy needs, with 68% of the final energy consumption delivered by biomass fuels in 2009. In 2003, only 4% of homes had access to electricity. However, the electrification rate has been growing rapidly; the access rate increased to an estimated 22% in 2011, an annual increase of 28% (Ministry of Energy Kenya, 2012). Although energy sector emissions have been increasing significantly, carbon intensity from electricity has decreased, demonstrating an opportunity for emission reductions in the electricity sector, at least on an intensity basis. This provides an opportunity for NAMAs in the electricity sector, which has been selected as one of the seven sectors for which sectoral scoping should be undertaken within sub-component-4 (NAMAs) of the CCAP. However, many challenges to implementing RE in Kenya still exist, as described in the following sections.

## Kenya Energy Policies

In order to plan for and accommodate increasing demand and capacity needs, Kenya has recently developed new energy policies and strategies. These are aligned with Kenya's long-term development plan, Vision 2030, which includes strategies for accelerated economic growth. A pre-requisite for this growth is an adequate and stable electricity supply. The 2012 National Energy Policy sets short-, medium- and long-term targets for both installed thermal and RE capacity and generation. The Policy aims to diversify energy generation, in particular to reduce the percentage of hydropower in the grid due to challenges associated with this energy source.

In 2010/2011, Kenya had 1,593 MW of installed capacity, generating 7.3 TWh, 69% of which came from renewable sources. Hydropower accounted for 47% of the power generated, followed by 28% from diesel generation and 20% from geothermal (Ministry of Energy Kenya, 2012). Minimal amounts of power generation currently come from co-generation, wind power and gas. The policy forecasts that the total installed capacity by 2030 will consist of geothermal (26%), nuclear plants (19%), coal plants (13%), gas turbines (11%), diesel plants (9%), wind plants (9%) and hydro plants (5%), while imports will provide up to 8% of energy needs (Ministry of Energy Kenya, 2012).

There are two key government initiatives to encourage the development of RE: a FiT and a tax exemption policy. The key points of each regulation/policy are listed in Table 9.

## Financing Options for Renewable Energy Projects

Financing for RE currently comes from four main sources: the Government of Kenya, the CDM, the Climate Investment Fund and private funding. The latter three sources are described further.

» CDM: Kenya is host to eight stand-alone CDM projects registered with the UNFCCC (*i.e.* six in the RE sector using biomass, geothermal, hydro and wind) and 18 projects (12 in RE) that are at the validation or audit stage. There are also three CDM programmes (PoAs) that encompass smaller projects under an umbrella framework, including small-scale RoR hydro, wind power and solar lamp distribution. It should be noted that this CDM activity will decrease significantly, if not stop altogether, after 2012 as Kenya is not a Least

Table 9: Main Features of Feed-In Tariffs and Tax Exemptions in Kenya

| Regulation/policy | Status | Key points |
|---|---|---|
| FiT | Introduced in 2008, revised in 2010 | » Only for RE<br>» Differentiated according to the six technologies covered; firm-power and non-firm power*<br>» Eligibility restrictions according to plant capacity<br>» Denominated in USD to decrease currency risk<br>» The tariff represents a maximum tariff and is negotiated on a case-by-case basis<br>» Granted for 20 years<br>» No inflation indexing of feed-in technologies |
| Tax exemption | Proposed in the latest draft of the National Energy Policy | » For all types of power generation, in order to encourage IPPs<br>» Differentiated according to four technology categories and plant capacities<br>» Exemption is provided for a different number of years, ranging from 5 years (10 MW–29 MW thermal energy) to 15 years (all geothermal, hydro and thermal >50 MW) |

*Source: Ministry of Energy Kenya (2010); Ministry of Energy Kenya (2012)*
**Electricity generated by sources with fluctuating supply*

Developed Country, therefore, it faces CDM credit import restrictions from the EU.

» Climate Investment Fund's Scaling-Up Renewable Energies Programme (SREP): Kenya is one of the six pilot countries selected as part of the SREP. The SREP operates under the Strategic Climate Fund, which is part of the Climate Investment Fund. It is funded by donors with the goal of promoting international cooperation on climate change and supporting developing countries in their efforts towards climate-resilient development. In Kenya, SREP will fund three different projects: a 400 MW geothermal station, solar water heaters and mini-hydropower plants.

» Private RET Funding: In 2009, KenGen, a Kenyan electricity generating company, held a public infrastructure bond offer worth KES 25 billion (~USD 300 million[33]). The bond offered was for KES 15 billion (~USD 180 million) with a KES 10 billion (~USD 120 million) "greenshoe" option that was issued since demand was sufficiently high. Institutional investors with a license in the Eastern African Community Partner States were allocated 80% of the bonds while 20% was reserved for retail investors (KenGen, 2009). The financing from the "greenshoe" option will enable KenGen to develop 500 MW of geothermal power.

## Challenges to RE Deployment

Even though Kenya already has a significant amount of RE, particularly hydropower and geothermal as well as a number of options available for funding RE projects, many institutional and implementation challenges for RE in Kenya still exist. These barriers may be general or sector-specific. Some sectors, particularly new ones (*e.g.* solar and wind), face significantly higher barriers than other, better established sectors, such as large-scale hydropower.

### Institutional Challenges

The SREP 2011 Investment Plan identified the following institutional challenges/constraints for RE in Kenya (SREP, 2011):

» Information barriers;

» Insufficient/inadequate data; and

[33] 12 September 2012 exchange rate of 1 USD=84.349 KES

- Low awareness of the potential opportunities and economic benefits.

Other barriers included:

- Lack of adherence to system standards by suppliers and poor after-sales service;
- Limited capacity for equipment acquisition/supply; and
- Human resource constraints.

Cost-related barriers included:
- Lack of appropriate and affordable credit and financing mechanisms.

One of the key instruments used to promote private sector, grid-connected RE in Kenya is the FiT. Kenya has been very progressive in the approval of FiT regulations. However, there are challenges with the application of this FiT that slow down policy uptake. The Ministry of Energy recognises challenges associated with the implementation of the FiT as follows (Ministry of Energy Kenya, 2012):

- Insufficient data to inform the level of tariffs for different technologies;
- Lack of awareness on FiT among potential investors;
- No clear guidelines on Power Purchase Agreement (PPA) negotiations which results in lengthy discussions; and
- Inadequate technical and financial capacity for some community-based projects.

There are also technology-specific RE institutional challenges in Kenya. The National Energy Strategy (Ministry of Energy Kenya, 2012) details many of these challenges. The institutional challenges per technology are listed in Table 10.

### Implementation Challenges

In addition to institutional challenges, there are also many technology-specific implementation challenges for RE in Kenya. The National Energy Strategy (Ministry of Energy Kenya, 2012) details many of these implementation challenges per technology in Table 11.

The combination of general, FiT-related and sectoral barriers can make the expansion of RE, especially private sector initiated projects, daunting. This is demonstrated by the fact that there are currently only six IPPs in Kenya. The following section discusses how NAMAs could potentially be used to help overcome some of the barriers associated with RE projects in Kenya.

## The Case for Supported NAMAs in Kenya

NAMAs can help overcome RE barriers and challenges in two key ways: through the provision of support to overcome institutional challenges and through the facilitation of projects/programmes that implement policies and regulations.

### Overcoming Institutional Challenges

Decision makers should keep in mind that NAMAs support can come, not only in the form of funding, but also in the form of technology assistance and capacity building. All three forms of support are highly relevant in helping to overcome institutional challenges.

Funding can be used to develop a RE research institute, which both trains and employs staff. Such an institute could be established in cooperation with Kenyatta University, which already offers a Masters Degree and a doctoral programme in RE.

Funding could also be used for reviews or studies to assess the current state and functioning of the FiT policy and, if it is not functioning in the manner intended due to inappropriate (too high or too low) tariffs, provide an appropriate action plan. Other funding proposals include: writing guidance for PPA negotiations in collaboration with the Ministry of Energy and other stakeholder inputs; drafting proposals to align approaches within government ministries towards RE; assessing small-scale hydropower standards and formulating appropriate standards and related regulations that are suitable for the local conditions; and finally developing regulations for grid connections, given that there is currently a lack of information about how long IPPs have to wait for a connection from their power plant to the national grid.

Table 10: Institutional challenges by technology

| Technology | | | | | | |
|---|---|---|---|---|---|---|
| Geothermal | Solar | Wind | Small scale hydropower | Large scale hydropower | Biomass | Biogas |
| Lack of pre-drilling feasibility data due to lack of human and capital resource to undertake the studies. | Disjointed approach in policy implementation and promotion of solar energy projects by the various ministries and organizations. | Most potential areas for wind energy generation are far away from the grid and load centres requiring high capital investment for transmission lines. | Destruction of catchment areas threatens long term viability of small hydro power projects. | The economic risk in hydropower projects is relatively higher than other modes of electricity generation because they are capital intensive and wholly dependent on hydrology. | Unsustainable use of biomass with negative impacts on the environment, leading to serious climate variability and unpredictability in rainfall patterns. | Lack of RD&D on biogas emerging technologies. |
| Competing and conflicting interests in use of natural resources. | Erosion of consumer confidence because of inappropriate system standards, faulty installations, importation of sub-standard systems and poor after sales service. | Inadequate wind regime data. | Inadequate financial resources and technical personnel for carrying out feasibility studies and development of sites. | A major challenge for hydro power projects is relocation and resettlement of affected persons. | Lack of appropriate legal and regulatory framework for sustainable production, distribution and marketing of biomass. | Inadequate skilled installation contractors in the country. |
| | Lack of awareness on the potential, opportunities and economic benefits offered by solar technologies. | Limited after sales service. | Inadequate hydrological data. | Inadequate hydrological data throughout the East African region that does not capture quality nor cover required periods of at least 50 years. | Limited awareness of the FiTs aimed at encouraging investment in RE. | Lack of clear registration and regulation guidelines for biogas installation contractors. |
| | Lack of appropriate credit and financing mechanisms to facilitate acquisition of solar technology. | Inadequate wind energy industry standards due to fast changing technologies and enhanced capacities of turbines. | Competing interests between developing the sites and usage of land and water resources by the affected communities and institutions. | Conflicting and competing land and water uses between various sub-sectors of the economy with regard to development and utilization of the same for electricity generation. | Inadequate data on biomass production and consumption. | |
| | | Competing interest in land use with other commercial activities. | Inadequate technical capacity to design, construct, operate and maintain the projects. | | Disjointed approach in policy implementation by the various ministries and organizations responsible for biomass energy use. | |
| | | Lack of RD&D in wind technologies. | Tariffs charged do not generate sufficient revenues to cover capital as well as operation and maintenance costs of the projects. | | Inadequate recognition of biomass as a source of energy, despite its predominance in the energy mix. | |
| | | | Inappropriate standards, legal and regulatory regime. | | Competing interests over land use between biomass plantations, food production and other commercial uses. | |
| | | | | | There is a gap between the existing tree cover vis-a-vis the minimum constitutional requirement of 10%. | |

*Source: Ministry of Energy Kenya (2012)*

Table 11: Implementation challenges by technology

| Technology | | | | | | |
|---|---|---|---|---|---|---|
| Geothermal | Solar | Wind | Small scale hydropower | Large scale hydropower | Biomass | Biogas |
| Relatively long lead time of between 5-7 years from conception to production of electricity. | Disjointed approach in policy implementation and promotion of solar energy projects by the various ministries and organizations. | High upfront costs. | Destruction of catchment areas threatens long term viability of small hydro power projects. | Hydropower is vulnerable to variations in hydrology and climate. | Emissions from wood fuel in poorly ventilated houses leading to health hazards among users. | Lack of information on the benefits and potential of biogas technology. |
| High upfront investment costs. | The percentage of solar energy harnessed for commercial and domestic applications is insignificant relative to the potential. | Limited after sales service. | Inadequate financial resources and technical personnel for carrying out feasibility studies and development of sites. | High economic risk as projects are capital intensive and wholly dependent on hydrology. | Use of inefficient technologies in production, conversion and consumption of biomass energy. | High upfront costs of domestic and commercial biogas plant and equipment. |
| High cost of drilling equipment. On average, a drilling rig costs approximately USD 30 million (2011 prices). | The cost of solar home systems has remained beyond the reach of many potential consumers despite favourable tax incentives. | | Inadequate hydrological data. | A major challenge is relocation and resettlement of affected persons. | | Lack of post installation operation and maintenance service for plant, equipment and appliances. |
| Expensive risks including sinking dry wells, contamination and possible collapse of wells. | Erosion of consumer confidence because of inappropriate system standards, faulty installations, importation of sub-standard systems and poor after sales service. | | Competing interests between developing the sites and usage of land and water resources by the affected communities and institutions. | Long lead time of between 7-10 years. | | |
| Remote location, siting restrictions and long distances to existing load centres necessitating heavy investment in transmission and other support infrastructure. | Rampant theft of solar photovoltaic panels, which discourages their installation. | | Inadequate technical capacity to design, construct, operate and maintain the projects. | Inadequate hydrological data that does not capture quality nor cover required periods of at least 50 years. | | |
| | Lack of awareness on the potential, opportunities and economic benefits. | | Lack of facilities to match load demand with the electrical output. | Conflicting and competing land and water uses between various sub-sectors of the economy. | | |
| | Lack of appropriate credit and financing mechanisms to facilitate acquisition of solar technology. | | Vandalism of electric power infrastructure. | | | |
| | | | Tariffs charged do not generate sufficient revenues to cover capital as well as operation and maintenance costs. | | | |
| | | | Inappropriate standards, legal and regulatory regime. | | | |

*Source: Ministry of Energy Kenya (2012)*

Technology support can be provided in the form of technical experts (*e.g.* experts who help oversee the construction of a new type of power plant). It can also be provided through facilitating discussions in the institutions on intellectual property rights (*e.g.* patents) for foreign technology, as well as for technology designed in Kenya, for instance by research institutes or the private sector.

Capacity building needs can be met through the placement of long-term technical experts in government agencies (*e.g.* in KenGen or in Rural Electrification Authority) or in research institutes to train staff. Technical assistance can also be provided on a short-term basis, such as through the provision of specific training courses.

### Overcoming Implementation Challenges

NAMA funding can be used to help overcome RE implementation barriers. The opportunities to overcome these barriers, as for institutional challenges, are also divided into the three possible areas of support; funding, technology transfer and capacity building. NAMA support can be provided for individual actions or within a more comprehensive umbrella framework encompassing several actions. This holistic approach is ideal, as long as support is not spread too thinly across disparate activities.

### Funding

Securing funding from banks or identifying interested private investors for RE projects can be very challenging in Kenya, as elsewhere. This is particularly true for IPPs, especially considering that there are currently only six IPPs in Kenya.

Financial support from NAMAs can be provided in a number of ways. For the government, support can come in the form of assistance to ensure that FiTs are provided as agreed upon or as assistance to increase FiTs if they are deemed too low to provide the necessary incentives.

For the private financial sector, support can be provided in a number of ways: establishing special revolving loans or low-interest loans for RE; capacity building with banks to ensure that banks thoroughly understand RE and can assess risks with sufficient knowledge; establishing an escrow account for donor funding that can only be accessed if the power plant cannot produce the expected generation or release the expected report of mitigation effects. Such an escrow account can help reduce the risk associated with lending to RE power plants. In 2011, L'Agence Française de Développement agreed to provide a EUR 30 million credit for two Kenyan banks (*i.e.* CF Stanbic Holdings Ltd. and the Cooperative Bank of Kenya). This funding is reserved exclusively for bank loans to private sector RE project developers (Westhuizen, 2011). NAMA funding can be used to provide further credit lines.

For private sector project developers, financial support for RE equipment can be provided. Low-interest loans or leasing agreements using turbines/generators as collateral (with purchase and ownership of the equipment by the bank) can also be provided to the developers.

### Technology Support

For technology transfer, support can be provided to both the Kenyan Government and Kenyan private sector developers in similar ways, including the provision of: equipment or subsidised equipment for RE power plants; equipment or subsidised equipment for RE infrastructure (*e.g.* transmission lines); systems to adequately collect necessary data for RE projects (*e.g.* hydrology data). Furthermore, support can be provided to establish facilities to manufacture equipment, such as replacement parts or turbines.

### Capacity Building

Capacity building support for Kenyan Government employees (*e.g.* employees of the Rural Electrification Authority or the Kenya Electricity Transmission Company Limited) can include: training in new technologies and systems; provision of an in-house technical expert; and support for government employees to attend external training courses. Capacity building for the private sector can include workshops and training in the technical and policy aspects of RE.

## Designing and Implementing a RE NAMA in Kenya: Lessons learnt

NAMA conceptualisation has been on-going in Kenya since January 2012 as part of the design of the fourth sub-component of the CCAP, a process funded by the Climate and Development Knowledge Network. Simultaneously, work has been conducted on each of the other seven sub-components and is expected to be completed in 2012. It will result in a comprehensive picture of climate change actions in Kenya.

To begin work on the NAMA sub-component, possible NAMAs were considered by consultants[34] who had been hired to conduct the NAMA conceptualisation process. NAMA briefs for identified key activities were developed. However, it was recognised that a better approach to identifying NAMAs was to first undertake sectoral analyses that would provide a more holistic approach. Analyses were done for seven sectors, including electricity generation, and consisted of: background, government priorities, a reference case, low-carbon scenario analysis and development options, feasibility of implementation and potential policy measures and instruments. The sector analyses are available online[35].

The need for a sectoral approach is a key lesson learnt from the Kenya work. Conversely, identifying individual actions may not serve well, particularly in countries with significant overlap between ministries or devolution to the local governmental level. Therefore, it may be appropriate to apply a sectoral approach for NAMA development. In this sectoral approach, relevant players in the specific sector (*e.g.* Ministries of Energy, the Environment, Forestry and Water) will collaborate on the NAMA development.

At the start of the Kenyan NAMA process, it was envisioned that an initial prioritisation of NAMAs could be undertaken as a relatively fast process within a few months. However, stakeholders realised that understanding and ownership of the NAMAs would be greater if the process was not rushed and prioritisation was done by decision makers within the Government of Kenya, which is the lead stakeholder.

A third key lesson learnt during the initial Kenya NAMA process is the need for alignment with the national CCAP. The Kenya CCAP was developed with the input and buy-in of many stakeholders. Kenya NAMA concepts cannot be finalised until the Action Plan is finalised as it will provide the wider framework under which the NAMAs are developed. It is crucial to work under a framework that has won government approval to ensure overall concept alignment.

## 5.3 CASE STUDY: GRENADA

The State of Grenada is a small island nation comprised of three islands; namely, Grenada, Carriacou and Petite Martinique. Grenada is a member of the "Organization of Eastern Caribbean States". The communities have a 99.5% electrification rate with 100% of the electricity generated through diesel-fired generator sets (DG sets) with a total installed capacity of 52.4 MW.

Although the entire electricity generation is fossil-fuel-based, the relatively small scale of the total installed capacity makes this market relatively unattractive for investments in any significant emission reduction and/or RE project. On the other hand, the low capacity requirements can be viewed as an advantage by technology suppliers and developed nations that seek to develop an integrated "smart grid" approach for RE and wish to use Grenada as a "test case". Dependence on oil imports and a weak economy has led the Prime Minister of Grenada to express the country's desire to seek 100% of its energy requirements through a combination of RE sources.

A multi-technology NAMA covering both energy generation and transportation could provide a strong framework for an integrated approach to Grenada becoming 100% green while giving scale to the project in terms of GHG abatement. A potential NAMA can help overcome Grenada's existing challenges, including access to technology and finance, while opening up opportunities for capacity building, especially with the St. George's University, and creating an enabling environment for potential donors. A word of caution: any NAMA needs to consider the key role of Grenada Electricity Services Limited (GRENLEC), the private company responsible for the generation, transmission and distribution of electricity, as this entity holds rights as the sole electricity provider to the islands until 2073.

[34] *International Institute for Sustainable Development, Energy Research Centre of the Netherlands, ASB Partnership for the Tropical Forest Margins at the World Agroforestry Centre.*

[35] *www.kccap.info/index.php?option=com_phocadownload&view=category&id=6&Itemid=41*

## Grenada: Energy Institutional Framework

The Department of Energy and Sustainable Development under the Ministry of Finance, Planning, Economy, Energy and Cooperatives is the government authority responsible for all decision making related to energy, including RE, in Grenada.

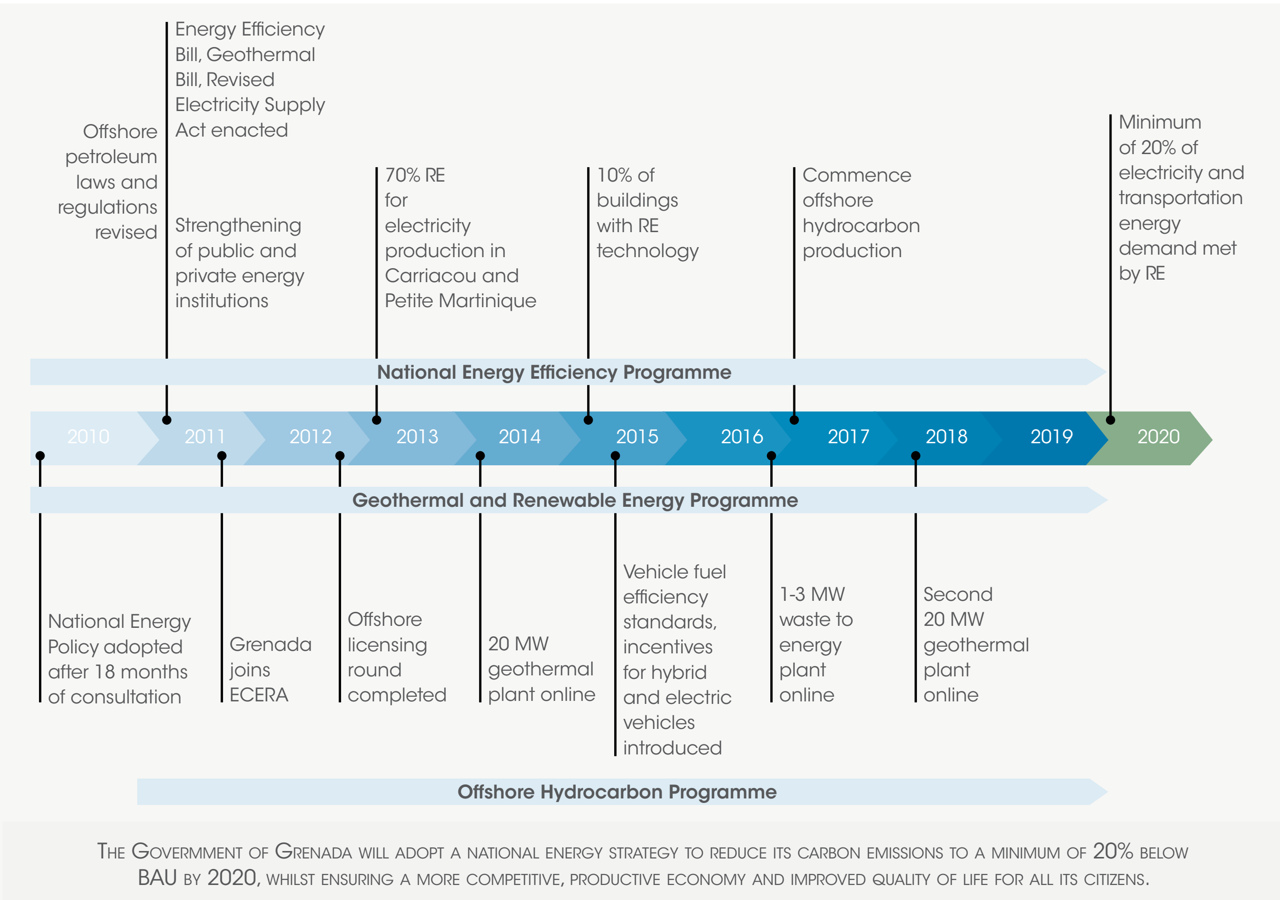
The GRENLEC is the single entity responsible for electricity generation, transmission and distribution services in the country. GRENLEC was government-owned until 1994 at which point the government decided to divest a portion of its shares. Today 50% of GRENLEC shares are owned by WRB Enterprises, Inc. (Florida, USA), a private entity, through Grenada Private Power Limited; 21% was retained by the Grenadian Government, including the National Insurance Scheme; and 29% was sold to other private shareholders.

## Energy Policy of Grenada

The Electricity Supply Act of 1994 was passed around the same time as the privatisation of GRENLEC and extended GRENLEC's rights as sole electricity provider to the islands until 2073 (UN Conference on Sustainable Development (UNCSD), 2012, p. 27). GRENLEC currently enjoys a monopoly within the Grenadian energy supply sector; thus, any potential changes to Grenada's energy mix will require its participation and cooperation.

The early 2000s witnessed a plethora of policy initiatives that demonstrated the government's commitment to environmental sustainability, including the National Environmental Management Strategy and the National Communication on Climate Change (2000). The first Sustainable Energy Action Plan (SEAP) was prepared in 2003 and in 2006 the SEAP was revised to integrate energy projects in national development and reconstruction plans with the Grenada Agency for Reconstruction and Development. The Grenada National Energy Policy (GNEP) was officially published in November 2011 and set a goal that "20% of all domestic energy usage (electricity and transport) will originate from RE sources by 2020." The GNEP also sets the key milestones for Grenada's low-carbon development strategy for 2010-2020.

Figure 9: Grenada Sustainable Energy Action Plan




*Source: SEAP, 2012, p.3*

### Feed-in Tariff System

In 2007 GRENLEC initiated a pilot project for 1:1 net metering that would accommodate 1% of its peak demand. This programme ended in 2011 with 52 customers subscribed to the programme with a capacity of 300 kW of interconnected RE. A new Standard Offer was then released in which a net billing arrangement was introduced, whereby GRENLEC would pay the avoided cost of fuel for all electricity delivered to the grid.

Present tariff rates for electricity in Grenada are in the range of USD 0.40 per kWh. For consumers investing in grid-connected solar PV systems, GRENLEC currently offers two schemes: the first involves a fixed rate of USD 0.17 per kWh for a ten year period for electricity exported into the grid; the second involves a variable rate based on oil prices.

### Other Selected Initiatives for Development of RETs

From early 2008 until mid-2010, the Government operated a USD 1.4 million Grenada Caribbean Solar Finance Programme, funded by the United Nations Industrial Development Organization (UNIDO), with the objective of promoting solar water heaters. The programme consisted of training for lending officers, a consumer awareness campaign and a pilot lending operation.

### CDM Projects in Grenada

Grenada is classified as a "Small Island Developing State" (SID) simplifying the development of CDM financed projects. However, there are currently no CDM projects in Grenada or in the Organization of Eastern Caribbean States region.

## Renewable Energy: Potential and Challenges

The IRENA country profile for Grenada indicates a "high" potential for solar, wind and geothermal energy, and a "low" potential for biomass, hydro- and ocean-based RETs (IRENA, 2012g). GRENLEC has a strategic focus to utilise RE to meet 10% of energy demand by 2013 and 30% by 2016, which is more ambitious than the goals set by GNEP. The company website states that GRENLEC is "currently assessing a number of mature renewable technologies, such as wind and photovoltaic, and emerging technologies like hydrokinetic and waste-to-energy possibilities". The next section briefly profiles the various RETs in the island's context.

### Solar Energy

In the aftermath of Hurricane Ivan, which caused a sharp increase in electricity prices, solar photovoltaic was introduced in Grenada as a credible alternative. Solar water heaters have gained increasing acceptance amongst the country's numerous resorts where air-conditioning and water heating are the two major power consumers. The GNEP states that solar technologies in Grenada have the highest penetration rate in the Eastern Caribbean (Government of Grenada, 2011, p. 9); however, this is relative. With the average solar irradiation levels at 5-6 kWh/m$^2$/day and integration of solar PV into the country's disaster management systems (*e.g.* hurricane shelter camps), installed capacity currently stands at 300 kWp and will necessitate a re-negotiation with GRENLEC for more favourable FiT rates.

### Wind Energy

Unlike solar technologies, both wind and geothermal are mentioned specifically on the GRENLEC website. GRENLEC is currently engaged in on-going efforts to install 1 MW to 2 MW of wind turbines on the island of Carriacou by 2014 (GRENLEC, 2011) through an EU co-funded initiative. GRENLEC is also carrying out wind speed measurements on two privately owned sites, where average wind speeds have been measured at 7.6 m/sec. The company's 2011 annual report indicates an additional capacity of 6 MW to 14 MW, which is at an "advanced stage of planning". Wind can account for 10 to 15% of the country's peak demand but, like geothermal, the introduction of wind energy would require significant technology transfer.

### Geothermal Energy

The "International Geothermal Association" has indicated that Central Northeastern Grenada may be "geothermally prospective". GRENLEC showcases geothermal energy as the "centrepiece of our RE programme". Various reports indicate a geothermal potential of 20 MW scalable up to 40 MW, but investments in geothermal technology are highly capital-intensive and heavily weighted toward upfront expenses (*e.g.* drilling of geothermal wells).

### Other Renewable Energy Options

Despite having a significant agrarian economy, no information exists on the potential of biomass/biofuels. Similarly, there are no specific data on harnessing ocean currents for energy generation.

## Renewable Energy: Key Barriers

Electricity rates in Grenada at USD 0.40/kWh are among the highest in the region (CARILEC, 2010, p.1.). Diversification of the energy portfolio remains one of the key challenges of the government. The common barriers are summarised as follows:

- Lack of adequate policies and strategies. A case in point is the pricing strategy for solar PV systems, which is currently skewed to benefit the utility.
- Lack of financing options for investments remains the key constraint for a small economy like Grenada and most investments in the past years have been for recovery from the devastations of the twin hurricanes.
- Lack of capacity of governments and utilities is typical for any small island nation dependent on fossil fuel.
- Lack of awareness, knowledge and confidence.

### The Role of GRENLEC in the Development of RETs in Grenada

As a private entity, it is unlikely that the GRENLEC management would encourage the development of RETs (*i.e.* third parties) that would put its own market share at risk unless it felt adequately compensated or equipped to profit from generating its own RE. Although GRENLEC has announced ambitious targets for the development of RETs and has also shown its intention to invest (*e.g.* Carriacou wind project), the investment required for new technologies (*e.g.* geothermal) is considerable and would require third party intervention and project financing. In sum, any deployment of RETs in Grenada would require the cooperation and participation of GRENLEC.

### The Challenges of Small Island Developing States

With an area covering 344 sq km, a population of 104,000 and a GDP of USD 816 million, Grenada lacks economies of scale and faces the challenge of keeping costs down from large technology suppliers to attract private investors. With an economy that has yet to fully recover following the twin hurricanes, and burdened with significant debt, finding additional funds/soft loans for the RET development poses a key challenge for the government. Despite their significant potential, the cost of drilling three geothermal wells is estimated between USD 9-15 million and is considered a risky investment. In this context, GRENLEC's turnover for 2011 was USD 70 million.

### Existing Infrastructure and Institutional Capacity

Launching the "Grenada Vision 2030" at Rio de Janeiro in June 2012, the Prime Minister of Grenada stated that "it is my Government's vision that by 2030, 100% of our primary energy demand for electricity generation and for transport will be provided by RE sources". Using its small size as an asset, Grenada has the potential to become "showcase model" for "distributed forms of energy production". However, the country would need significant capacity building efforts, in partnership with the country's St George's University, to strengthen its existing electricity grid network, identify the most suitable technology for deployment, engage the appropriate expertise to evaluate techno-commercial proposals and evolve appropriate tariff rates. The Government has moved forward from the initial criticism surrounding the Electricity Supply Act and signed the Barbados Declaration, voluntarily committing "to a minimum target of reducing its total GHG emissions by 20% below BAU by 2020" (UNDP, 2012, p.8).

## The Case for Supported NAMAs

A country-wide multi-technology single NAMA covering all RETs can provide the required critical mass for carbon credit buyers and sector-specific NAMAs (*e.g.* tourism industry) and significantly improve the balance of payments as well as the overall socio-economic benefits. With electricity tariff rates amongst the highest in the region, the tourism industry risks defaulting on payments to GRENLEC while trying to retain its market share, compete with other east Caribbean states and maintain profitability. NAMAs can thus play a key role in sustaining the island's economy, especially as costs for RET are now clearly below GRENLEC's retail tariffs.

For a relatively small economy like Grenada where any investment in RETs would require an international source of funding, a supported NAMA loan could provide the initial capital to cover RET investment costs. This loan would be secured by the right to collect electricity payments for the electricity delivered by the RET. Given that under such a concept, electricity rates could be reduced considerably in the short run, the government might have an incentive to override GRENLEC's monopoly. Given the small size of the islands, this could be linked to the nationwide introduction of electric vehicles, which could pave the way towards a 100% renewable Grenada.

Design and implementation of a NAMA would require that the government involve the private sector and public institutions to enhance the scope, ambition and time frame for implementation through training and capacity building programmes (*e.g.* introduction of RET courses at St George's University). Small distributed energy systems (*e.g.* battery-based PV systems) also have the potential to generate additional employment opportunities for the local population.

## Designing and Implementing a Renewable Energy NAMA in Grenada: A Blueprint for SIDS?

There are currently no NAMA-related activities in Grenada, although the government has shown clear signals of its intention to introduce RETs into the energy mix. The challenges faced by Grenada are typical of those faced by SIDS in general:

- Lack of human capital to conceptualise and prepare a long-term strategy for a NAMA in line with the country's overall developmental goals, as well as implementing specific actions under the NAMA.
- Little chance of large RET providers setting up a manufacturing base in Grenada, meaning that the technology would always require to be imported, resulting in significantly higher costs for the technology.
- Higher costs and other market factors (*e.g.* higher debts, lower ratings) would also increase borrowing costs, making it additionally difficult to secure financing for projects unless the revenues are ring-fenced. Therefore, unlike other larger developing nations where NAMAs can play a significant role in incentivising the growth of RETs, in the case of SIDS, NAMA incentives would need to be combined with other "softer" financial packages and grants to make RETs affordable.

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