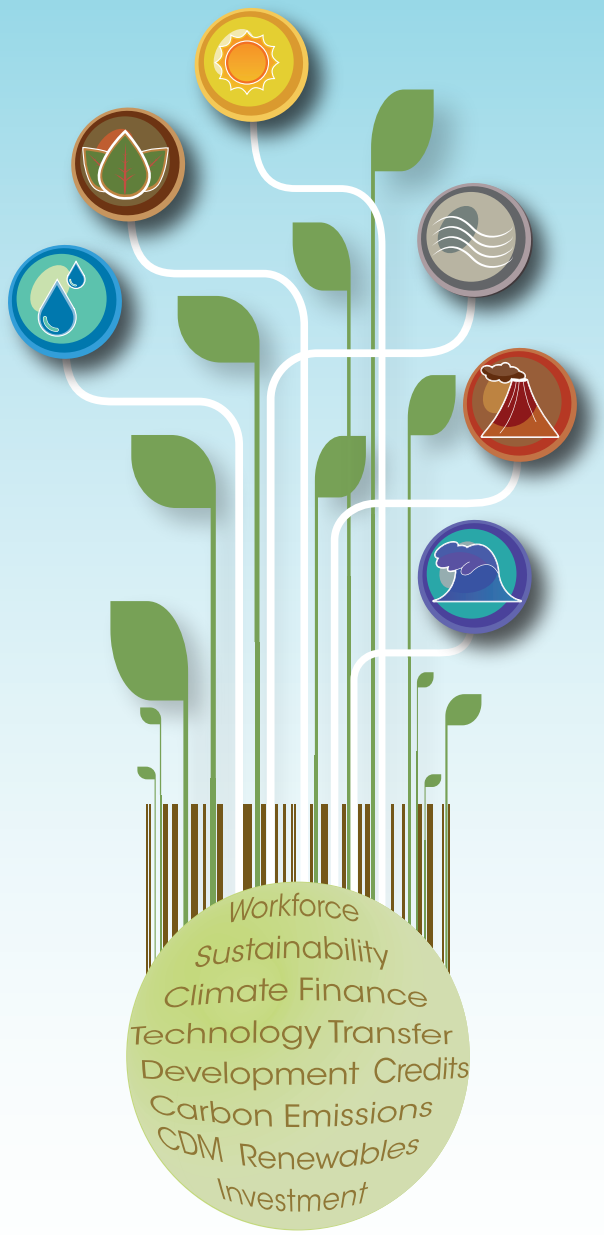
IRENA
International Renewable Energy Agency

IRENA Handbook on Renewable Energy Nationally Appropriate Mitigation Actions (NAMAs)

2ND EDITION



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About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international co-operation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity. www.irena.org

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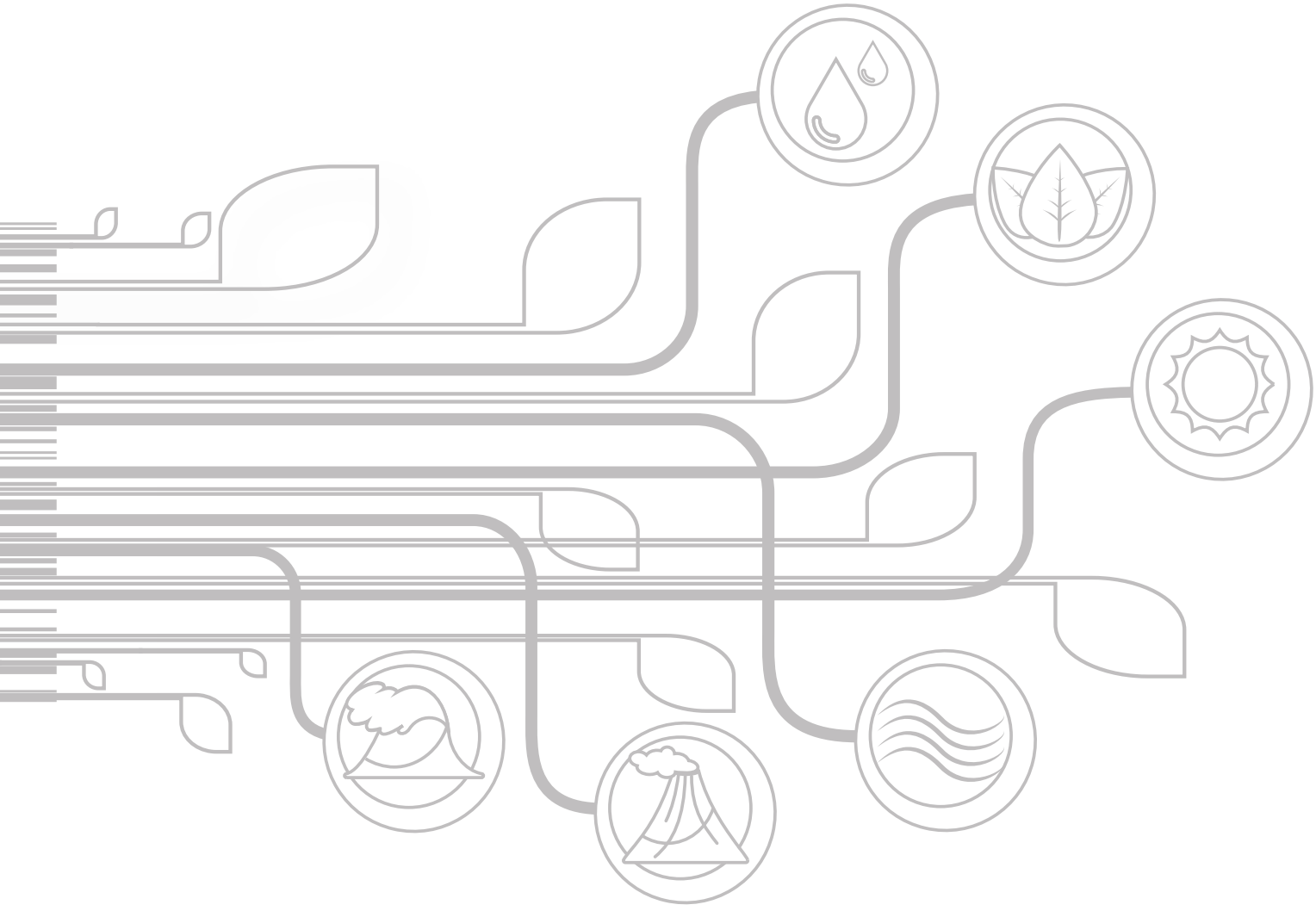
Acronyms

ANME	Agence Nationale pour la Maîtrise de l'Energie, Tunisia (National Agency for Energy Conservation)
BAU	Business as usual (scenario)
Bancomex	Banco de Comercio Exterior, Mexico
BMUB	Federal Ministry for the Environment, Nuclear Safety, Building and Nature Conservation, Germany
BUR	Biennial update reports
CERs	Certified Emissions Reductions
CCAP	Climate Change Action Plan
CDM	Clean Development Mechanism
CER	Renewable Energy Centre, Chile
CFE	Comisión Federal de Electricidad, Mexico (Federal Electricity Commission)
CICC	Commission on Climate Change, Mexico
CIPIE	Commission Interdépartementale de la Production Indépendante d'électricité, Tunisia (Interdepartmental Commission for Independent Power Production)
CNE	National Energy Commission, Chile
CO_2e	Carbon Dioxide Equivalent
CONAVI	National Housing Commission, Mexico
COP	Conference of the Parties (to the UNFCCC)
CORFO	Chilean government's economic development agency
CRE	Comisión Reguladora de Energía, Mexico (Energy Regulatory Commission)
CSPIE	Commission Supérieure de la Production Indépendante d'électricité, Tunisia (High Commission for Independent Power Production)
DEEVi	Diseño Energéticamente Eficiente de la Vivienda, Mexico (Energy efficient housing design tool)
DNA	Designated National Authority
DT	Tunisian Dinars
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
ENCC	National Climate Change Strategy, Mexico
FDI	Foreign direct investment
FiT	Feed-in tariff
FSF	Fast Start Finance
GCF	Green Climate Fund
FNME	Fonds National de Maîtrise de l´Énergie, Tunisia (National Fund for Energy Conservation)
GDP	Gross domestic product
GEF	Global Environment Facility
GHGs	Greenhouse gases
GIZ	DeutscheGesellschaftfürInternationaleZusammenarbeit (German International Cooperation Agency)
GWh	Gigawatt hour
INDC	Intended Nationally Determined Contribution
ICA	International Consultation and Analysis
IFC	International Finance Corporation
IPP	Independent power producer
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency

kCERs	thousand CERs
$ktCO_2e$	thousand tonnes of CO_2e
kV	Kilovolts
kW	Kilowatt
kWh	Kilowatt hours
LAERFTE	Law for the Development of Renewable Energy and Energy Transition Financing, Mexico
LCDS	Low Carbon Development Strategy
LEDS	Low Emission Development Strategy
LULUCF	Land-use, Land-use Change and Forestry
MENA	Middle East and North Africa
MRV	Measurement, Reporting and Verification
MW	Megawatt
NAMA	Nationally Appropriate Mitigation Action
NAFINSA	Nacional Financiera S.N.C., Mexico
NCRE	Non-Conventional Renewable Energy
NGO	Non-governmental organisation
ODA	Official development assistance
OECD	Organisation for Economic Co-operation and Development
PBCCh	Platform for the Generation and Trading of Forest Carbon Credits
PECC	Programa Especial de Cambio Climático, Mexico (Special Climate Change Program)
PHPP	Passive House Planning Package, Mexico
PMR	Partnership for Market Readiness
PoA	Programme of Activities (Clean Development Mechanism)
PPA	Power Purchase Agreement
ppm	parts per million
PV	Photovoltaics
RECs	Renewable Energy Certificates
REDD	Renewable Energy Development Division
REN21	Renewable Energy Policy Network for the 21st Century
RET	Renewable energy technology
SAAVi	Simulación del Ahorro del Agua en la Vivienda, Mexico (House water saving simulator)
SEDATU	Ministry for Agrarian, Territorial and Urban Development, Mexico
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales, Mexico (Secretariat of Environment and Natural Resources)
SENER	Secretaríatde Energía, Mexico (Energy Secretariat)
SINACC	National System for Climate Change, Mexico
SSRE	Self-supply Renewable Energy
STEG	Société Tunisienne de l'Electricité et du Gaz (Tunisian Company for Electricity and Gas)
tCO_2e	tonne CO_2e
TNA	Technology needs assessment
TWh	Terawatt hours
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
VAT	Value Added Tax



Foreword

Two years after the first edition of this handbook was released, the importance of Nationally Appropriate Mitigation Actions (NAMAs) as a promising instrument for reducing carbon emissions continues to increase. Scientific evidence of climate change and the serious threat it poses continues to mount. Countries around the world are making serious efforts to respond to this threat, while at the same time addressing pressing development challenges, such as expanding access to energy.

Against the backdrop of rising demand for sustainable energy solutions, there is a growing convergence around the role that renewable energy deployment can play in addressing climate change, while providing access to affordable energy. Declining technology costs, improving performance, better financing frameworks and a deeper understanding of the wider socio-economic benefits of renewable energy are spurring increased deployment, accompanied by an ever-growing landscape of supportive policies.

While such trends are encouraging, barriers remain at the national, regional and international levels. To overcome these, countries need to explore and use all possible means, including NAMAs. These instruments provide an innovative framework through which countries can reconcile potentially competing objectives, namely development and greenhouse gas mitigation.

This second edition of IRENA's handbook demonstrates that NAMAs are gaining momentum. New country case studies have been added, providing examples from Chile, Mexico and Tunisia that illustrate experiences over the past two years. By facilitating the removal of barriers to deployment, NAMAs help establish processes that promote renewable energy for electricity generation in developing countries by facilitating implementation, enhancing transparency and engaging all stakeholders.

I am confident that this updated handbook will further contribute to an international dialogue aimed at developing renewable energy NAMAs. Such ongoing research and engagement is an important element in promoting the global deployment of renewable energy as a viable, available and affordable solution to climate change.

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Adnan Z. Amin
Director - General, IRENA

Executive Summary

Context

This second edition of IRENA´s Handbook on Renewable Energy Nationally Appropriate Mitigation Actions (NAMAs) focuses on the role that NAMAs can play in promoting renewable energy for electricity generation in developing countries. The concept of NAMAs was developed during the negotiations carried out under the United Nations Framework Convention on Climate Change (UNFCCC) to denote planned, voluntary greenhouse gas (GHG) mitigation actions in developing countries, and has become a prominent climate policy instrument in recent years. In practice, specifying a NAMA entails identifying and communicating to the UNFCCC national development activities with mitigation effects that are consistent with national development priorities and circumstances, and that can be measured, reported and verified. Over the last years, numerous NAMAs have been announced, conceptualised and even implemented – many of which focus on renewables. Renewable energy interventions, due to their low carbon emissions potential, are ideal NAMA candidates, combining development benefits through the provision of energy with greenhouse gas emissions reductions. Renewable energy NAMAs are therefore consistent with strategies to engage countries on a "green growth" path.

What are NAMAs?

NAMAs are voluntary interventions to reduce greenhouse gas emissions in developing countries undertaken as part of a country's sustainable development objectives. A key characteristic of NAMAs is that GHG emission impact is measurable, reportable and verifiable (MRV). NAMAs aim to promote low-carbon development and can range from multi-sector strategies, to specific policy instruments, to single projects.

A wide range of policies promoting renewable energy can be considered NAMAs as these fulfil the dual requirements of contributing to development objectives and, due to the low carbon content of renewable sources, reducing emissions. These policies could involve non-market-based incentives, market mechanisms or regulations. The implementation of large-scale, policy-based NAMAs can easily cost tens of millions of US dollars or more. In Copenhagen in 2009, industrialised countries pledged to support mitigation action in developing countries, through several initiatives including the provision of financial support for NAMAs. Initially, only NAMA feasibility studies were financed. However, over the last two years, several NAMA support vehicles have been launched and a significant share of international climate finance could flow into NAMAs in the near future. It is hoped that the capitalisation and operationalisation of the Green Climate Fund (GCF) will also provide finance for both NAMA readiness activities and implementation.

Under the UNFCCC, two kinds of NAMAs have been defined on the basis of how they are financed: domestically supported NAMAs ("unilateral NAMAs") are those developed with domestic means, while internationally supported NAMAs ("supported NAMAs") are those requiring international support in addition to domestic sources to cover NAMA costs (support can also include technical assistance or capacity-building measures). NAMAs that achieve quantifiable GHG reductions also have the potential to generate tradable credits and can thus receive funding through the international carbon market. While the Parties have yet to agree on the design of future carbon market mechanisms, this option is presently actively considered amongst Parties via actions

[1] *As per NAMA Database (2014) and without Copenhagen Accord NAMAs.*

outside the scope of the UNFCCC (for instance under the World Bank-led Partnership for Market Readiness Initiative) as well as being tested through other bilateral initiatives.

As of September 2014, many countries are actively engaging in exploring or developing NAMA opportunities and nearly 30% of all NAMAs address renewable energy[1]. These renewable energy NAMAs encompass all relevant Renewable Energy Technologies (RETs) and cover a broad spectrum of instruments and measures to promote renewable energy in host countries. Such measures include financial support activities such as feed-in tariffs, coverage of incremental costs, renewable energy funds, grants and soft loans; improvement of the regulatory framework conditions for renewable energy (*e.g.,* energy policy reform assessments, stakeholder dialogues, electricity market restructuring that supports independent power producers); technical elaboration of conditions for renewable energy (*e.g.,* through grid code development); strategy development for the promotion of public-private-partnerships and integration of renewable energy into national development priorities; outreach, marketing and awareness-raising campaigns; development of MRV frameworks; as well as capacity building measures such as training for stakeholders on operation and dispatch, or for banks and project developers on the economics of renewable energy (NAMA Database, 2014).

NAMAs as a tool to promote and enhance renewable energy deployment

Barriers to 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 subsidies or feed-in tariffs, are required to promote RETs. Furthermore, a combination of measures will likely be required for the cost-effective transfer and diffusion of RETs. The removal of political and institutional barriers has been slow in many countries. An international mechanism or approach that is viable for supporting renewable energy may encourage policy makers to accelerate this process.

Instruments and measures to overcome barriers for RETs can take the form of policies that target non-monetary barriers or provide financial incentives for deployment. Non-monetary regulatory instruments or measures can include mandatory grid access for RET operators, technical assistance for operating the technology or labelling the power produced using RETs. Financial incentives can be broadly classified as non-market-based incentives related to government budgets or as market-based incentives, for instance through GHG emissions pricing. Market-based incentives remain rare but are increasingly considered in emerging markets and developing countries. The recent IRENA publication REthinking Energy (IRENA 2014a) underlines that in the power sector (one of the most relevant sectors with respect to anthropogenic GHG emissions) renewable energy and conventional energies differ substantially with respect to emissions intensity (per kilowatt hour). Renewable energy has the potential to drive a systematic change in the GHG emissions intensity of the global power system: doubling the renewable energy share in electricity generation until 2030 could decrease the world average GHG emissions intensity per kilowatt hour (kWh) by 30%. This number underscores the relevance of renewable energy for fighting anthropogenic climate change and highlights its importance in climate policies. In this context, instruments and measures that

[2] *In September 2014 17% of NAMAs are project based, while 63% represent policies or strategies. For 20% the type ofaction is unknown (NAMA Database, 2014).*

help overcome barriers for further RET deployment are aligned with objectives of international climate policy – and thus can be designed as NAMAs.

NAMAs represent a broad support vehicle. Depending on their nature, NAMAs can take the form of any instrument that supports RET development. As described above, they already range from broad strategies (*e.g.,* a renewable energy percentage target), to policy measures such as sweeping feed-in tariff programmes, to awareness-raising campaigns for citizens' use of renewable electricity, down to the project-level such as through specific "lighthouse projects" financed by governments (*e.g.,* large-scale solar parks) or concrete mitigation projects (*e.g.,* implementation of large-scale wind power projects)[2].

Case Studies: The role of renewable energy NAMAs in selected developing countries

This updated handbook introduces three new case studies illustrating the potential role of renewable energy NAMAs in countries of varying size, namely Tunisia, Chile and Mexico. The analysis assesses the barriers for renewable energy deployment for each country and reflects first experiences regarding NAMA development and implementation. Further examples of renewable energy NAMAs are provided in textboxes throughout the document. The key messages from the cases are the following:

NAMAs can play a central role in creating an **enabling environment** for renewable energy, in particular:

- They can help achieve broader energy policy targets, as demonstrated by the Chilean case study;
- They are perceived as an important vehicle for mobilising political support for renewable energy, as the examples of Mexico and Chile show. Still, interest of political actors is a necessary but insufficient requisite for smooth NAMA development; as underscored by the long development timeline experienced in Tunisia;
- NAMAs can complement the activities of existing climate policy instruments, such as the Clean Development Mechanism (CDM).

Moving a NAMA from a feasibility study to actual **implementation** is a challenging undertaking, in particular policy makers and NAMA developers should consider that:

- NAMAs can only be realised if they are consistent with existing domestic regulatory frameworks and are supported by the appropriate governmental institution. The lack of host country ownership was a contributing factor to the Tunisian NAMA's long lead time;
- NAMAs need to be in line with the national development priorities and strategies. In national debates, the co-benefits are often more important than the GHG emission reductions;
- A centralised NAMA management structure and careful design, both in the concept and implementation stages, is helpful in ensuring alignment with national strategies. The Chilean and the Mexican NAMA cases provide helpful insights in this regard;
- Data availability and transparency are necessary to ensure a robust MRV system for the NAMA.

With NAMA development gaining momentum, the focus is now shifting towards **NAMAs financing**. Developers and policy makers should consider that:

- NAMAs can allow access to new sources of financial support for renewable energy projects and programmes potentially through initiatives such as the Green Climate Fund;

- International financing is limited in scope and can be linked to a number of conditions, including the transformational nature of the NAMA; the stringency of Measurement, Reporting and Verification (MRV); or the transparency of policy processes. Even for the well-defined NAMAs in Chile and Mexico, acquisition of international support was a time consuming process;

- Involvement of financial actors is recommended to enable leveraging private sector finance and the use of adequate financial instruments in order to maximise benefits of scarce public funds, such as in the case of the Chilean NAMA.

How to get a NAMA concept off the ground

NAMA development can build on various experiences of mitigation action, such as on the framework of renewable energy-related development assistance or the market mechanisms under the Kyoto Protocol (*e.g.,* the CDM). However, a robust and transparent NAMA design and engagement of relevant stakeholders are requisites to developing a credible programme with broad support.

Putting forward a specific NAMA idea, such as the announcement of a feed-in tariff for renewable energy, is only the first in a long series of steps towards its practical implementation. Before a NAMA reaches implementation and achieves GHG emissions reductions, NAMA-related actions need to be identified, selected, conceptualised and approved by the government and possibly submitted to the UNFCCC Secretariat to be recorded in the NAMA Registry. Although there are various approaches for structuring and identifying the stages of NAMA development, this handbook applies three phases: conception, implementation and operation. The conception phase covers the development of the NAMA from the initial idea to a comprehensive concept study. The implementation phase deals with the translation of the concept into practice (*i.e.,* adaptation of the concept to political, economic, social and technical realities). The operation phase, in which the NAMA is conducted and evaluated, begins after the NAMA is implemented and launched.

The expected output of the NAMA conception phase is a full-fledged, bankable NAMA concept accompanied by a NAMA Concept Note that evolves throughout the process. Before the concept can be elaborated, the NAMA coordinator needs to clearly identify 1) the objectives of the NAMA and 2) the existing and planned national policies. The entity initiating the NAMA (*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, particularly in the energy sector. Furthermore, plans for low-carbon development and untapped potential for RET deployment need to be understood in order to gain a preliminary idea of areas appropriate for renewable energy NAMA development. Identifying the regulatory/policy environment can involve various players. This first stage of NAMA development, comprised mainly of conceptual desk work and initial coordination amongst stakeholders, is a relatively easy task compared to the complexity and higher costs of implementing these NAMA measures in practice.

The host country government can decide whether to move the NAMA from the conceptual to the implementation stage, based on the NAMA concept study and note. 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 will also be required to enable the implementation of the underlying policies and measures within the host country. While NAMAs are still a young instrument, it is increasingly apparent that the leap from developing a concept to implementing the action covered under the NAMA is a challenge. This challenge explains why a majority of NAMAs remain stranded in the concept stage.

Once the NAMA activities have been initiated, it is important to administer the NAMA according to the management procedures defined in the NAMA conception and implementation phase, particularly regarding the MRV system for tracking and verifying emission reductions and other positive impacts. In order to extract lessons learned from all experiences under the NAMA, an evaluation process should be initiated from the start.

1. Introduction

Renewable energy is a critical means for meeting the ever growing energy demand while simultaneously addressing anthropogenic climate change, particularly given the magnitude of the energy sector's contribution to global GHG emissions (IPCC, 2011). This updated version of IRENA´s Handbook focuses on the vital role Nationally Appropriate Mitigation Actions—known as NAMAs—can play in promoting renewable energy for electricity generation in developing countries. The concept of NAMAs was developed during negotiations 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. In recent years, NAMAs have become a prominent international climate policy instrument. Specifying a NAMA requires the identification and communication of national development activities with mitigation effects that are consistent with national development priorities and circumstances whose impacts can be measured, reported and verified. NAMAs can showcase a country's unilateral mitigation activities and/or attract international support for the implementation of such activities via financial, technical or capacity-building assistance, while at the same time lead to further social, economic and environmental benefits ("co-benefits"). Renewables have become an integral part of the global power sector and have played an increasingly large role in meeting countries' energy security needs, experiencing substantial growth rates over the past decade. Global investments in renewable energy have risen from USD 40 billion to USD 214 billion between 2004 and 2013 (excluding large hydropower). Renewables accounted for 58% of net additions to the global power capacity in 2013 (IRENA, 2014a and UNEP FS and BNEF, 2014).

Regarding specific technologies, global installed wind capacity reached 318 GW in late 2013—more than 6.5 times the existing level ten years before; installed solar photovoltaics (PV) capacity grew by more than a

factor of 50, from 2.6 GW in 2004 to 139 GW in 2013; and grid-parity (*i.e.,* when costs of solar power equalise with retail electricity prices) has been attained at various locations. By early 2014, 138 countries, a majority of which are emerging markets or developing countries, had renewable energy support policies in place (REN21, 2014a). Nevertheless, 78% of the total final energy consumption still comes from non-renewable sources (ibid.), energy use is continuing to grow at a rapid pace, and barriers to renewable energy deployment continue to exist. Overcoming these barriers will pave the way for swifter and continued renewable energy development.

Economic development in conjunction with growing energy demand, particularly in emerging markets, has led to a surge in CO_2 emissions over the last decade. CO_2 is the most relevant measure of "greenhouse gases" that drive anthropogenic climate change; its atmospheric concentration has risen from 280 parts per million (ppm) in pre-industrial years to 400 ppm in 2013. Since 1850, global temperatures have already increased by over 0.7°C; if GHG emissions continue to grow unchecked, temperatures could rise by more than 4°C by the end of this century.

Under the framework of the UNFCCC, endorsed in 1992, over 190 governments have committed themselves to preventing a dangerous level of climate change. Renewables can play a key role in mitigating climate change since they allow for the decoupling of GHG emissions from further economic growth and increased energy production. This "green growth" path is particularly interesting for developing countries that can benefit from renewable energy in several ways, such as by providing an attractive option to increase electrification in rural areas currently lacking grid access. In the long run, renewable energy 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 use can be prevented.

NAMAs address both climate change and national development strategies through the design of public sector interventions that mobilise actions that can be undertaken at scale so as to promote and achieve low-carbon development. NAMAs could therefore be instrumental in promoting and achieving the expanded use of renewable energy sources.

This Handbook addresses NAMAs as a tool for renewable energy experts and policy makers that can be used to support renewable energy deployment in developing countries. Chapter 2 introduces the NAMA concept and discusses why NAMAs are of interest to IRENA Members. Chapter 3 analyses NAMAs in the context of renewable energy, illustrating typical renewable energy barriers and outlining potential NAMA activities. Opportunities for financing renewable energy NAMAs are discussed in Chapter 4. The Handbook concludes (Chapter 5) with 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. Chapter 6 is comprised of three case studies on experiences with NAMAs in the field of renewable energy in Tunisia, Chile and Mexico. These case studies illustrate the barriers to renewable energy within specific country circumstances and discuss how NAMAs can help in overcoming them.

2. Introducing NAMAs

A NAMA is a voluntary intervention to reduce GHG emissions in developing countries that are undertaken in the context of a country's sustainable development strategy. They can take any form of activity or set of activities, ranging from the implementation of renewable energy 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 prevent focus on specific "fashionable" policy instruments. Through this "low-emission development" strategy, well-designed NAMAs bring benefits beyond GHG emission reductions. These co-benefits can include sustainable development effects (*i.e.*, economic, social and environmental) and tend to act as the main drivers for the underlying policy labelled as a "NAMA".

Besides gaining international recognition, the NAMA can harness financial, technical and capacity-building support from international partners and donors[3].

There exists no clear international agreement or definition of what comprises a NAMA. The only formal requirement for a NAMA is compliance with national development plans and achievement of GHG reductions that can be measured, reported and verified (UNFCCC, 2007).

NAMAs entered the climate policy agenda in 2007 when the Conference of the Parties (COP) to the UNFCCC coined the term as part of the "Bali Action Plan". The Cancun agreements of 2010 compiled mitigation actions that developing countries communicated to the UNFCCC (UNFCCC, 2010). In late 2011, the 17th session of the COP to the UNFCCC in Durban, South Africa made a number of important NAMA-related decisions, including the establishment of a registry and an international Measurement, Reporting and Verification (MRV) process (UNFCCC, 2011a). The latter is partially covered in the International Consultation and Analysis (ICA), which is based on biennial update reports (BURs) by developing countries. Over the years 2012 and 2013, the conceptual approach for NAMAs was further debated. COP 18 established a two-year work programme to further the understanding of the diversity of NAMAs (UNFCCC, 2012c). Recommendations for MRV that were adopted by COP 19 in 2013 remain very weak (UNFCCC, 2013a). Today, NAMAs have become an actively pursued climate policy instrument and are likely to become an even more 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. To move towards such a global climate policy regime, COP 19 required Parties to define "Intended Nationally Determined Contributions" (INDCs) for inclusion into a future climate treaty. INDCs can become a relevant driver for countries to further embark on NAMA development and support. Moreover, it is important to be clear about the nature of NAMA 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, including financial mechanisms under the UNFCCC such as the Global Environment Facility (GEF) or the Green Climate Fund (GCF).

Countries can, for example, propose a regulation/standard (*e.g.,* a building code requiring integrated solar PV modules) and implement it as a NAMA. For advanced developing countries, a system of tradable permits or a fossil fuel tax recycled into renewable energy investments could also be framed as a NAMA. Feed-in tariffs or reverse auctions for renewable energy capacity are policy instruments that have shown their ability to attract renewable energy investment relatively 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 can be a combination of different policies and specific

[3] *See Chapter 4 for a discussion on the landscape of climate finance and opportunities for support of financing NAMAs.*

activities implemented as a single concerted effort. A NAMA could even be defined as an overall increase of renewable energy deployment or a certain quantitative target for renewable energy penetration in the long term, without specifying the policy instruments used in detail. However, such an approach risks remaining inefficient and is therefore not recommended.

NAMAs could also harness revenues from carbon markets if emission reductions under the NAMA generate emission credits. While the Parties are yet to agree on the design of future market-based climate policy instruments, this option is presently actively considered amongst Parties via actions outside the scope of the UNFCCC (for instance under the World Bank-led Partnership for Market Readiness Initiative) as well as being tested through other bilateral initiatives. In this context, one must distinguish between existing and future market mechanisms. The Clean Development Mechanism (CDM) created by the Kyoto Protocol is an example for the former. The CDM is an economic instrument designed to generate emissions reduction credits and is the most successful of the market mechanisms under the UNFCCC to date. Under the CDM, emission reductions are usually generated by comparing reference level ("baseline") emissions with project emissions scenarios (*i.e.,* the situation after a project measure has been started). This approach can, for example, involve comparing the energy mix in the grid 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 and can then be traded on the carbon market. CDM activities are either realised as stand-alone projects or as Programmes of Activities (PoAs), a scheme that allows bundling an unlimited number of similar projects. To date, the CDM has resulted in the issuance of emission credits representing more than 1.4 billion tonnes of carbon dioxide equivalent (CO_2e) saved. Potential CDM co-benefits include technology transfer and sustainable development. Text Box 1 lists the key differences between CDM activities and NAMAs as they are currently defined.

Box 1

KEY DIFFERENCES BETWEEN NAMAS AND CDM PROJECTS

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.
- NAMAs have a stronger focus on co-benefits.
- The CDM has strict rules for testing each project for additionality (*i.e.,* the difference from business-as-usual). 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: see inter alia RCREEE, 2011 and UNFCCC, 2013c

One decade of intensive work and learning-by-doing has progressed the CDM in its development of a functioning governance structure, accounting rules, methodological standards, environmental safeguards, a robust MRV framework, a transparent and independent process, participatory elements, host country ownership and quality assurance for data quality. Through this evolution, the CDM has matured into a functioning and accepted instrument with a large toolbox and wealth of lessons related to GHG mitigation activities. In general, NAMA development can benefit from these experiences gained under the CDM. For instance, one can utilise over 200 existing CDM baseline and monitoring methodologies and leverage them when defining a NAMA MRV (see UNFCCC, 2014c).

The first NAMA ideas were submitted in the context of the pledges that were made immediately following the Copenhagen Accord (UNFCCC, 2009a) in early 2010. These submissions differed from the NAMAs seen today as they were very heterogeneous, both in the type of action and the degree of details provided, and often only consisted of a generic list of sectors or programmes. Since then, more countries have submitted NAMAs to the UNFCCC (see the compilation in UNFCCC, 2013b) and many are currently 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 the introduction of certain policies (see Text Box 2) as well as specific projects (see Text Boxes 3 and 4).

Unilateral and supported NAMAs

NAMAs can be defined as unilateral or supported depending on the nature of the support provided. 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 resulting in quantifiable emissions reductions could receive complementary funding through the generation of carbon offset credits (often called "NAMA crediting") that are then traded on the carbon market[4]. However, mechanisms for crediting NAMAs are not yet officially defined under the UNFCCC; thus, NAMA crediting still remains under consideration.

According to the UNFCCC (2011), NAMA costs should be regarded either as full or incremental. While there is no universally accepted definition of these cost concepts, they may be more appropriate for specific mitigation projects rather than for policies. Full NAMA costs might be differentiated as follows, depending on the activity covered.

Investment in a concrete renewable energy project: The sum of investment, operation and maintenance, and de-risking 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 including costs of implementing 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 baseline development costs and those 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). To illustrate, in order to meet a national power generation goal, 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 (*e.g.,* through GHG reductions). The cost difference between this option and the baseline development option is then the incremental cost.

Numerous NAMAs proposed to date are seeking support, and the requests have become more elaborate over time (NAMA Database, 2014). 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 that can 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

[4] *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). Today, NAMA crediting is primarily discussed outside the UNFCCC.*

Box 2

NAMA ON THE INTRODUCTION OF PV IN THE NATIONAL ELECTRICAL GRID OF URUGUAY

Since 2005, Uruguay has actively pursued the introduction of non-conventional renewable energy. Initial steps focused on specific measures to facilitate the integration of wind power and biomass into the national grid, as well as to promote the use of solar thermal for domestic hot water production in the commercial-services, industry, public and, more recently, residential sectors. In addition, the government aims to increase the share of electricity generation from PV and is exploring opportunities for power purchases from private PV energy producers (see www.energiasolar.gub.uy for the Uruguayan Solar Plan). To date, two PV farms have been piloted to test grid connectivity.

In this context, the "NAMA on the introduction of PV Energy in the national electrical grid of Uruguay" has an objective to achieve 200 MW installed PV capacity by the year 2020. To reach this goal, the NAMA aims to provide capacity building in order to open the legal and technical regulatory framework towards PV, while simultaneously generating knowledge and expertise for the sustainable future incorporation of PV power into the national energy mix.

For this purpose the NAMA has been uploaded to the NAMA registry and is seeking USD 2 million of support. Over the years 2015 – 2017, the financial support shall be used for enabling capacity building activities and for the creation of infrastructure, specifically:

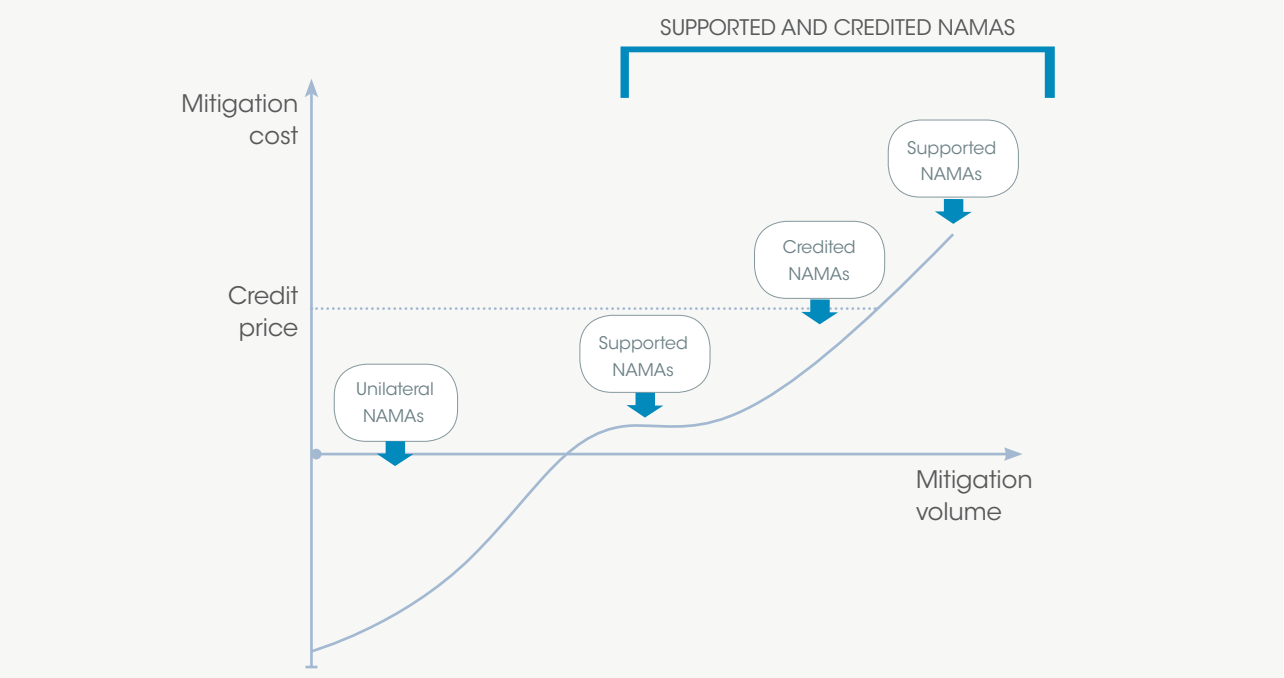
- Strengthening the assembly and maintenance of the national PV network,
- Creation of testing laboratories,
- Capacity-building support for public regulators and the public electric utility,
- Creation of specific technical regulatory framework for PV,
- Training professionals in the areas of engineering and architecture as well as technicians who will work in the development and maintenance.

First calculations indicate the measures outlined under the NAMA could achieve GHG emission reductions of 4.6 million tCO_2e over a period of 25 years through the replacement of fossil fuel based energy production. The Secretary of Energy and the Ministry of Industry, Energy and Mining are jointly responsible for the NAMA coordination. For managing the funds, they will build upon previous programmes on wind and biomass energy. A barrier assessment has so far not been conducted, nor an MRV plan developed.

Source: NAMA Database, 2014 and UNFCCC, 2014a

positive cost options or at very high-cost options that are not economical for the carbon market to capture. As a result, and only once they become an official NAMA type, credited NAMAs could harness the emission reduction potential that has positive GHG abatement costs remaining below a certain carbon credit price. Any support offered by industrialised countries under a supported NAMA would help cover the incremental costs, or a certain share of the full costs, of the policy or action but would unlikely finance it completely. 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: Authors

NAMA Registry

The UNFCCC has established a "NAMA Registry"[5], a voluntary and publicly available online platform operated by the UNFCCC Secretariat. The registry can be used by developing countries to upload their NAMA activities for recognition or attracting international support, as well as by international donors and other relevant stakeholders to publicly announce their available resources for financial, capacity-building, and technological support.[6] The registry distinguishes between three categories of users, namely NAMA Developers, NAMA Approvers, and Support Editors:

- NAMA Developers can create, edit, update, and delete their own NAMA entries as well as submit them for approval.
- NAMA Approvers are responsible for approving all individual NAMAs within their country before they are recorded in the registry. They may create, edit, update, and delete entries for their country, as well as approve access for "NAMA Developers".
- Support Editors can create and submit entries to indicate support of NAMAs. Developed country Parties and public or private organisations with support programmes relevant to NAMAs may receive Support Editor access to the NAMA registry.
- The UNFCCC has published a NAMA registry manual[7] (UNFCCC, 2014b) that explains the use of the registry in detail. Registry entries can be made for the following three different categories:
  - 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 in by the respective industrialised countries or organisations.

[5] *Access the NAMA registry at: www4.unfccc.int/sites/nama/SitePages/Home.aspx (UNFCCC, 2014a)*

[6] *In October 2014 three NAMAs were listed to have received support in the NAMA registry, see www4.unfccc.int/sites/nama/SitePages/SupportedNAMAs.aspx*

[7] *Available at: http://unfccc.int/files/cooperation_support/nama/application/pdf/nama_registry_manual_19_february_2014.pdf*

Standardised formats are to be used, with different templates for NAMAs seeking preparation and implementation support, NAMAs seeking recognition, and for the provision of information on available support.[8]

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.[9]

The NAMA registry does not require a very transparent and comprehensive approach regarding uploaded NAMA documentation. However, NAMA developers and approvers and donor agencies may require a more detailed dataset and transparent understanding of emission reductions achieved by the NAMA. For information included in the NAMA documentation and issues of transparency and MRV, see Chapter 5. Moreover, NAMAs 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 5.

Overview of status of NAMA development

NAMA development is still a young process, making it difficult to trace all NAMA initiatives around the globe. A good resource in this context is the NAMA Database (2014), which provides a comprehensive (although non-exhaustive) overview of NAMA development. Furthermore, the UNFCCC NAMA Registry (2014a) provides information on the status of global NAMA development.

Box 3

NAMA SUPPORTING 100% RENEWABLE ENERGY BY 2020 IN THE COOK ISLANDS

The Cook Islands government has set a goal of 100% renewable electricity by 2020 with a phase-in implementation plan seeking to achieve a 50% target by 2015. This NAMA outlines the support requirements beyond those already secured from international sources. Currently, diesel generators supply the power in the publicly owned electricity systems. The objective of this NAMA is to replace these diesel generators with renewable sources of electricity, reserving diesel generators only for emergency back-up purposes.

The activities under the NAMA represent only part of the overall plans to achieve the renewable energy target and include:

- RET trades training courses,
- Policy assistance for new legal and regulatory frameworks, in particular those required for private sector investment in renewable energy electricity system.

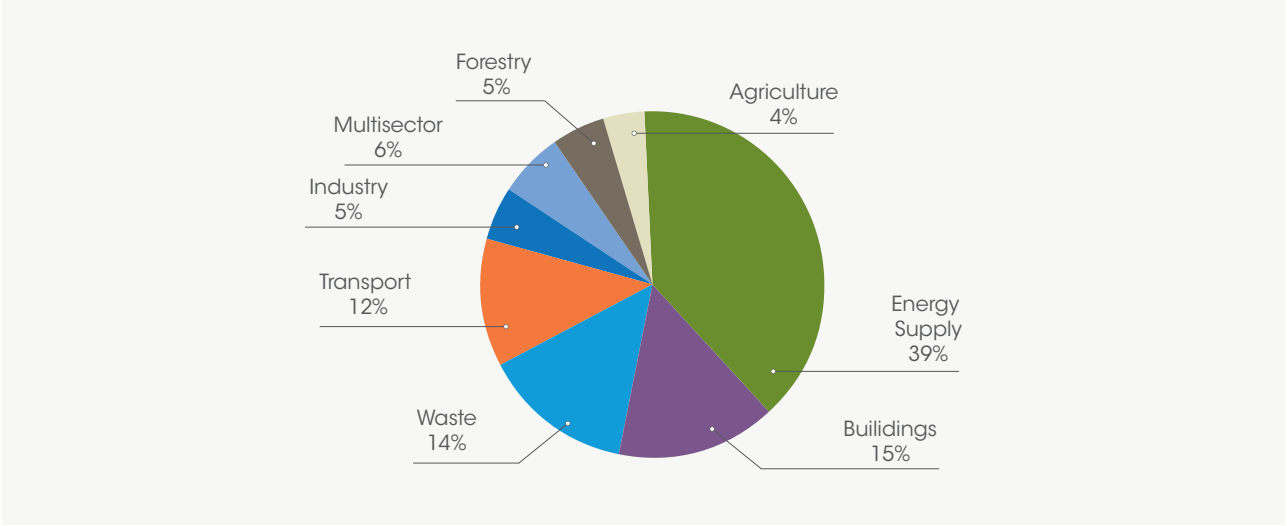
The NAMA development and implementation is coordinated by the national Renewable Energy Development Division (REDD), which started the NAMA development in 2013 and aims to conclude all measures under the NAMA by 2020. While the overall costs to reach the 100% renewable energy target by 2020 are expected to amount to USD 200 million, the required finance to support the NAMA implementation is USD 440.000. Based on the current total electricity generation per annum in the Cook Islands, the benefits of replacing diesel generation with renewable sources of electricity are estimated at 25 kt CO_2e. However, an MRV plan has not yet been defined.

Source: NAMA Database, 2014; UNFCCC, 2014a

[8] *Templates are available online at: http://unfccc.int/cooperation_support/nama/items/7476.php*

[9] *In accordance with decisions 1/CP.16, paragraph 53, and 2/CP.17, paragraph 45. Accordingly participation is voluntary and only information that has been specifically requested for recording in the NAMA registry is found in this platform.*

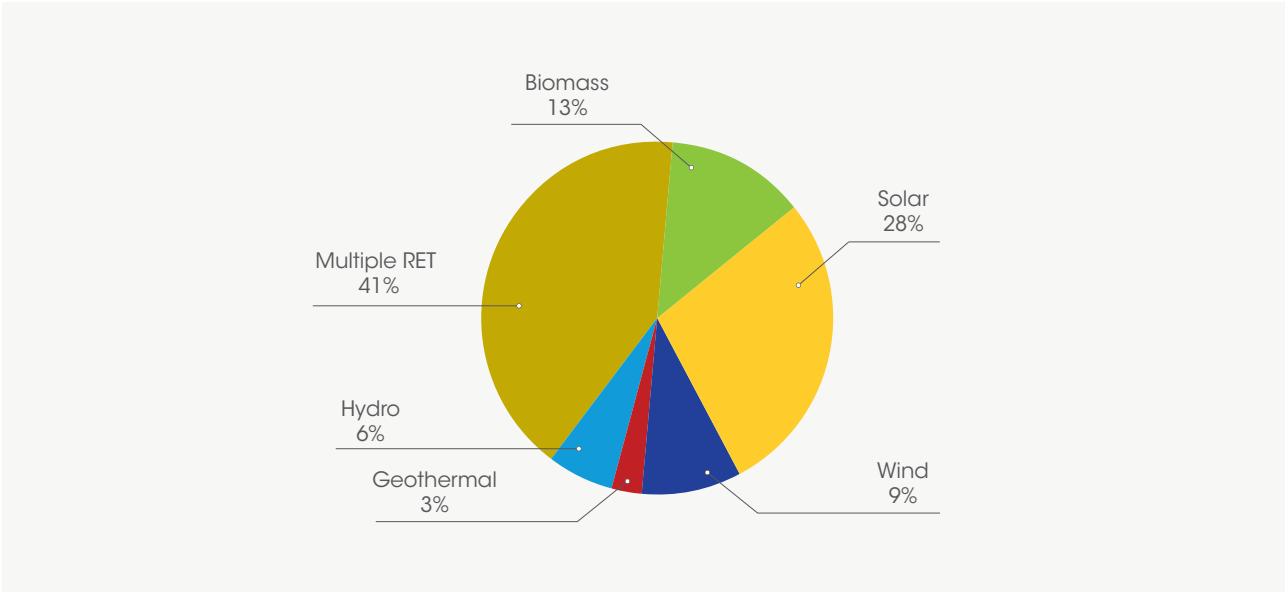
Figure 2: Distribution of NAMAs by sector, September 2014



Source: NAMA Database, 2014

As of September 2014, the NAMA Database held 129 NAMAs in various stages of development—of which 23 were listed as feasibility studies, 99 were listed as concepts under development, and seven as being in the implementation stage—and spanned across 37 countries.[10] A large number of NAMAs involve a support component. With respect to the geographical distribution, the majority of NAMAs are based in Latin America (44%) and Africa (25%), while only 19% are located in Asia. In terms of distribution by sector (Figure 2), the energy supply sector represents by far the largest share (39%, of which two thirds are renewable energy), followed by buildings (15%), waste (14%) and transport (12%) (NAMA Database, 2014). Renewable energy based NAMAs are located in Latin America (44%), Africa (22%), Asia (16%), Southern Europe (12%) and Middle East (6%). These renewable energy NAMAs comprise various RETs (Figure 3) such as solar (*e.g.*, solar PV deployment on the level of national programmes as well as private household solar water heating activities), biomass (*e.g.*, energy generation from biomass or small biomass boilers for private use), hydro (*e.g.*, construction of new dams or revitalisation of existing plants) or the promotion of wind farms. Instruments and measures covered by such NAMAs take various forms, including financial support activities such as feed-in tariffs, coverage of

Figure 3: Breakdown of technologies used in renewable energy NAMAs



Source: NAMA Database, 2014

[10] *Note that these numbers are indicative, as they only include NAMAs listed in the NAMA Database, which claims to provide up to date information but by nature is only a secondary source. Hence, there may be additional NAMA development processes that are not represented in the NAMA Database.*

incremental costs, renewable energy funds, grants and soft loans; improvement of the regulatory framework conditions for renewable energy such as through energy policy reform assessments, stakeholder dialogues, and enhancement of electricity market liberalisation (for instance by supporting independent power producers); technical elaboration of conditions for renewable energy through grid code development; strategy development for the promotion of public-private-partnership and for integrating renewable energy into national development priorities; outreach, marketing and awareness raising campaigns for renewable energy; development of MRV frameworks for energy projects; as well as capacity building measures such as training for stakeholders on operation and dispatch, or for banks and project developers on the economics of renewable energy (NAMA Database, 2014).

The UNFCCC NAMA registry lists 47 NAMAs seeking support (14 for preparation, 33 for implementation) and 4 for recognition. Three NAMAs are listed as having received support (UNFCCC, 2014b). According to the NAMA Database (2014), more than 71% of all NAMAs are national initiatives, 11% are sub-national and 18% are project-based. Almost two thirds (63%) of the NAMAs involve strategies or policies.

Box 4

NAMA ON FINANCING PRIVATE SECTOR PARTICIPATION TO RENEWABLE ENERGY DEVELOPMENT IN THE PHILIPPINES

Despite vast renewable energy sources, roughly 10% of the Filipino population does not have access to energy, and the country remains heavily reliant on imports – primarily from fossil fuels - to meet its growing energy demand. To accelerate renewable energy deployment, the Philippines has set long-term capacity targets as well as approved and implemented a range of fiscal and non-fiscal incentives. The National Renewable Energy Program calls for increasing renewable energy capacity from 5,400 MW in 2011 to 15,400 MW by 2030.

In this context, the objective of the "Philippine Financing Facility to Support Private Sector Participation to renewable energy Development" NAMA is to develop, implement and institutionalise support mechanisms to encourage private sector participation towards accelerated renewable energy development in the country, inter alia through market based mechanisms. In addition, the implementation of viable renewable energy business models are expected to foster the economic development in so called eco-towns, while public decision makers shall be supported in the design of an attractive RET regulatory framework.

Over the period from 2014 – 2018, the NAMA shall implement the following four main activities:

- Capacity needs assessment and development for renewable energy,
- The creation of a financing programme called the Renewable Energy Construction Loan and Guarantee Fund (RECLGF) that serves as a credit mechanism to finance renewable energy investments during the first three years of the NAMA,
- The foundation of the Renewable Energy Investment Coordination Center (REICC) to provide a one-stop-shop for all stakeholders and investors,
- Project monitoring and evaluation.

The NAMA is jointly coordinated by the Department of Energy (DOE) and the Climate Change Commission and seeks support of USD 21 million for covering total NAMA related costs

Source: NAMA Database, 2014 and UNFCCC, 2014a

3. The Rationale for NAMAs in Renewable Energy and Discussion of Design Options

Barriers impacting the implementation of renewable energy

Since the early 1990s, several countries, driven by concerns over rising oil prices and energy security, began to implement policies for the development of RETs.

These policies aim to remove barriers that prevent large-scale RET deployment and introduction of economies of scale. Since RETs have been marketed as an alternative to "fossil energy", most of these 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 subsidy and taxation rates, ease of access to resources, transport costs etc., the policies for RETs have also been country/region-specific.

In general, barriers for RET deployment can be political, economic, financial, legal, regulatory, technical, institutional and even cultural in nature[11]. Table 1 broadly summarises barriers to RET deployment:

Table 1: Barriers impacting RET deployment

TYPES OF BARRIERS	CHALLENGES
Barriers related to costs and pricing	» 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 increase the final levelized cost of electricity
	» Non-hydro RETs are also comparatively smaller than conventional energy projects in terms of installed capacity, making it more difficult to exploit scale effects.
	» Lack of awareness of RETs and insufficient information of their potentials and benefits increases uncertainty and consequently their capital costs through perceived high risks.
	» Relative lack of readily available and comprehensive data sets for high quality planning leads to perception of higher risks, which further leads to an increase in costs.
Barriers related to capital access	» Many developing countries with a significant RET potential struggle with foreign direct investment (FDI) related challenges due to risk factors, such as legal security, policy predictability, counterparty risk, high-risk premiums on third party finance, constrained access to capital, etc.
	» The risk-weighted rate of return on capital investments and insufficient information about RETs and past experience related to poor performance of some RET projects results in investors and utilities being hesitant to provide capital, and financial institutions denying credit since no appropriate collateral is available.
Barriers related to legal and regulatory framework, including market access	» In many developing countries, generation and distribution of electricity continues to be run by the state, with power utilities operating as a monopoly and with the knowledge base focused around conventional forms of energy. This may lead to omission of RET in recommendations to policy makers turning to these utilities as the first source of information.
	» Utilities see decentralised RETs operated by Independent Power Producers (IPPs) as potential competition and do whatever is possible to prevent transparent grid access rules for RET.
	» Tariff regulations are often designed against independent producers and RET licensing is slow and subject to cumbersome requirements.
Barriers related to social and environmental impacts	» Unlike conventional power plants, RETs by their nature are distributed over a larger geographical area (*e.g.* wind turbines) and are often associated with direct impacts, such as noise or visual pollution, which may result in a "not-in-my-backyard" mentality and public resistance.
	» In hydro projects, the creation of reservoirs, may involve displacement and resettlement of people due to submergence of agricultural land and settlements, leading to significant loss of livelihood.
	» There are also associated losses of natural habitats, and natural and human heritage sites.

[11] *For a reflection of barriers for NAMA development see Averchenkova (2014)*

Table 2 provides an overview of the range of investment and generation costs of selected RETs. Despite the decreasing costs for renewable energy installation and generation (REN21, 2014a) economic barriers continue to exist (*e.g.,*in comparison to natural gas power plants).

A combination of measures will be required for a cost-effective transfer and diffusion of RETs. However, many of the barriers translate into higher RET costs or risk premiums compared to conventional energy sources. For this reason, most RET promotion instruments are traditionally designed to improve the economic parameters of projects through subsidies or other financial support mechanisms. Removal of political and institutional barriers has been slow in many countries. However, an international mechanism or approach viable for supporting renewable energy may encourage policy makers to accelerate this process.

NAMAs can serve as such a mechanism as they can utilise any form of instrument to support RET development. As described in Chapter 2 above, they already range from sweeping feed-in tariff 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 below.

Instruments and measures to promote RET

Instruments and measures to overcome barriers for RET can take the form of policies that target non-monetary barriers or provide financial incentives for deployment. While non-monetary instruments can include a variety of measures such as mandatory grid access for RET operators, technical assistance for operating the technology and labelling of power produced using RETs, financial incentives can be broadly classified (as per IPCC, 2011) as follows:

Non-Market-Based Incentives are related to governmental budgets. When used as "carrots", subsidies, grants and / or tax allowances incentivise potential RET investors to undertake activities / investments that would not have occurred otherwise. As "sticks" or penalties, these non-market-based incentives take the form of taxes, charges or fees levied on conventional energy. These "sticks" can also be framed as regulations (*e.g.,* building codes requiring RET installation). Budget-neutral incentives would require the combination of a "carrot" with a "stick". For example, feed-in tariffs financed by a consumer levy would be budget-neutral. While policy "carrots" 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)	
		OECD	NON-OECD
Hydro	550** – 4,800	0.012 – 0.29	0.14 – 0.15
Solar PV (utility and end user scale)	1,300 – 4,300	0.11 – 0.46	0.11 – 0.46
Solar CSP (with storage)	6,300 – 10,500	0.17 – 0.37	0.16 – 0.37
Wind onshore	1,400 – 2,150 and 1100 –1600***	0.05 – 0.16	0.04 – 0.19
Wind offshore	4,000 – 4,500	0.15 – 0.23	-
Geothermal	2,000 – 5,900	0.05 – 0.29	0.04 – 0.18
Biomass	800 – 6,800	0.05 – 0.29	0.04 – 0.19
Natural Gas (for comparison)	700 – 2,000	0.06 – 0.13	

** LCOE for a 10% WACC ** Low end is for existing dams *** The second (lower) is for China and India*

Source: IRENA (2013), IRENA (2014e) and World Energy Council (2013)

TABLE 3: POLICY-BASED NAMAS

	INSTRUMENT / MEASURE	DEFINITION
NON-MARKET-BASED		
Fiscal incentives	Grant	Monetary assistance does not have to be repaid and is bestowed on an eligible recipient by a government for specified purposes.
	Energy production payment	Direct payment from the government per unit of renewable energy produced.
	Rebate	One-time direct payment from the government to a private party to cover a percentage or specified amount of the investment cost of an renewable energy 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	Reduction in income tax burden in the first years of operation of renewable energy equipment.
Public Finance	Investment	Financing provided in return for an equity ownership interest in a renewable energy company or project.
	Guarantee	Risk-sharing mechanism aimed at mobilising domestic lending from commercial banks for companies and projects that have high perceived credit (*i.e.* repayment) risk.
	Loan	Financing provided to a company or project in return for a debt obligation.
	Public procurement	Preferential purchase of renewable energy services (*e.g.* electricity) and/or renewable energy equipment by public entities.
Regulations	Quota obligation or mandate	Designated parties (*e.g.* generators, suppliers, consumers) obliged to meet minimum (often gradually increasing) renewable energy targets.
	Tendering/ Bidding	Tenders for given quotas of renewable energy supplies or supply capacities organised by public authorities and winning bids remunerated at prices usually above standard market levels.
	Fixed payment FIT	Guarantee that renewable electricity receives priority access and dispatch, and gets a fixed price per unit per technology during a specified number of years.
	Premium payment FIT	Guarantee that renewable energy supplies earn an additional payment on top of their energy market price or end-use value.
	Net metering (also net billing)	Provision of a two-way flow of electricity between the electricity distribution grid and customers with their own generation.
	Priority or guaranteed access to network	Provisions of renewable energy supplies with unhindered access to established energy networks.
	Priority dispatch	Mandates that renewable energy supplies are integrated into energy systems before supplies from other sources.
MARKET-BASED		
Regulations	Renewable Energy Certificates	Tradable certificates based on regulations defining an RET obligation (*e.g.* RPS).
	Carbon trading	Fossil energy producers that surrender GHG emission allowances.
	Carbon offsets	RET projects that generate GHG emission credits that can be sold on the market.
	Green energy purchasing	Regulation of the supply of voluntary renewable energy purchases by consumers beyond existing renewable energy obligations.
	Green labelling	Government-sponsored labelling (beside private sector labels) guaranteeing 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 renewable energy).
OTHER INSTRUMENTS		
	Public support for renewable energy R&D	RET development in public labs.
	Technology diffusion and capacity building	Training programmes.
	International networks/ cooperation	Organisation of conferences to learn from the experiences of RET pioneers

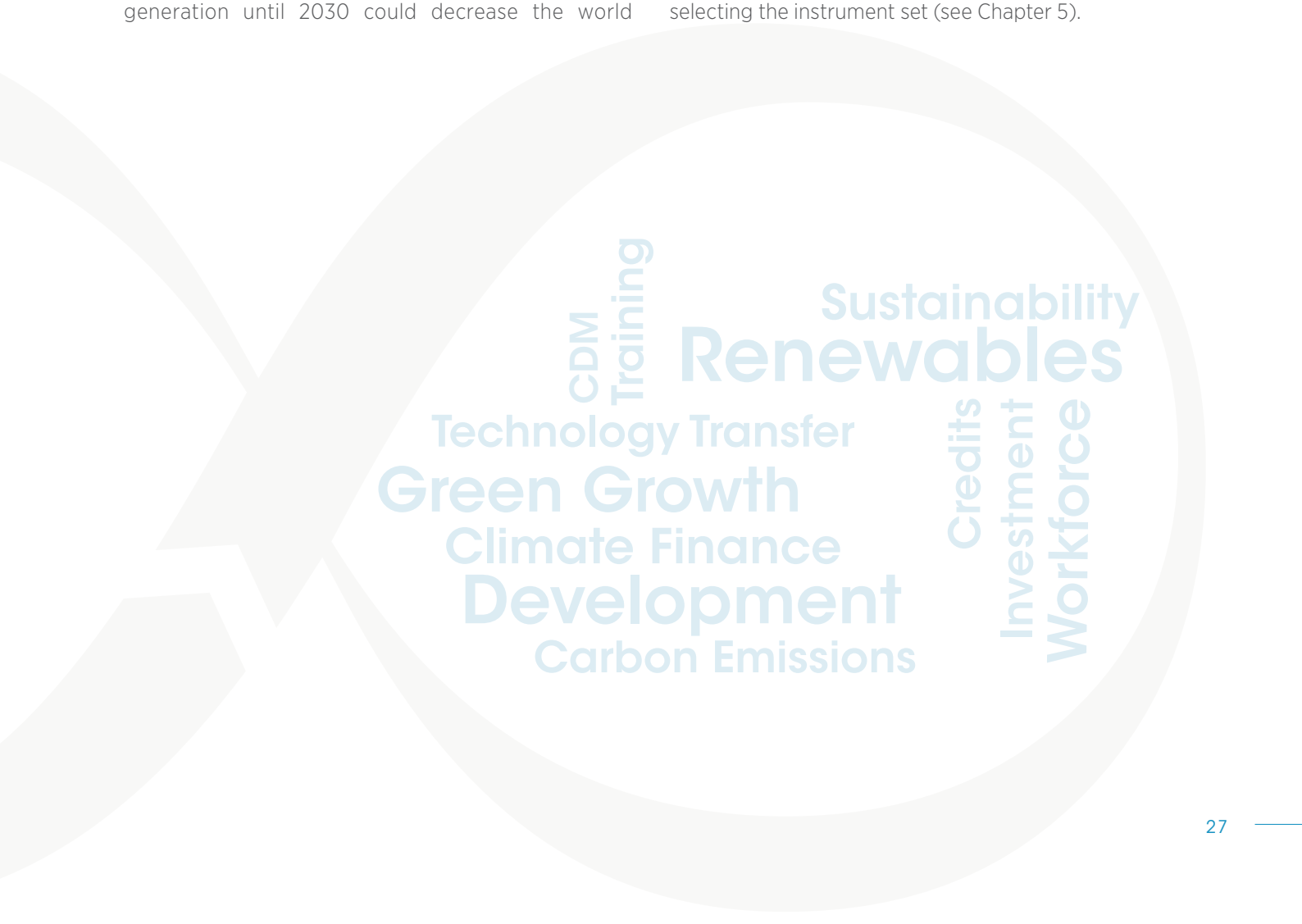
Source: Based on IPCC, 2011.

Market-Based Incentives generate incentives through the perception of scarcity, leading to the establishment of 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. Such market-based incentives always require regulation. A special form of market-based incentives is carbon market mechanisms. In this scheme, RET projects generate tradable emission credits and offer an advantage over fossil-fuel based utilities who must buy emissions allowances.

Such carbon emissions pricing schemes underline the relevance of GHG emissions in the development of emerging markets and developing countries. IRENA's publication REthinking Energy (IRENA 2014a) underlined the fact that in the power sector, one of the most relevant sectors with respect to anthropogenic GHG emissions, renewable energy and conventional energies differ substantially with respect to both emission intensity (per kWh) as well as lifecycle emissions. Renewable energy has the potential to drive a systematic change in the GHG emission intensity of the global power system: doubling the renewable energy share in electricity generation until 2030 could decrease the world average GHG emission intensity per kWh by 30%. This number underscores the relevance of renewable energy for fighting anthropogenic climate change and highlights its importance in climate policies. In this context, instruments and measures that help overcome barriers for further RET deployment are aligned with objectives of international climate policy – and thus can be designed as NAMAs.

Table 3 illustrates a non-exhaustive list of instruments and measures for promoting RET that can be developed as NAMAs.

Before choosing any instrument or measure for supporting RET, it is important to conduct a robust barrier assessment in order to identify the most appropriate decisions. Barriers may be purely financial or mainly political. In the former case, RETs remain more costly than conventional energy, and budgetary means to cover this cost differential are lacking. In the latter case, powerful fossil fuel interest groups may prevent the introduction of instruments promoting renewable energy. For example, feed-in tariffs may be unable to provide incentives because a monopoly state utility blocks grid access. As many of the instruments and measures listed in Table 3 comprise fiscal incentives, it is imperative to involve financial expertise when selecting the instrument set (see Chapter 5).



4. Opportunities for Financing Renewable Energy NAMAs

Since the release of the first version of this handbook, NAMA development has gained momentum, with the focus now shifting towards options for financing NAMAs. This chapter therefore illustrates the growing landscape of climate finance available for supporting the development of NAMAs. In addition, the text elaborates on the structuring of the financial concept for NAMAs and concludes with an overview of potential international NAMA support vehicles.

In 2013, more than USD 93 billion (40% of the total) was invested in RET in developing countries (IRENA, 2012). Since the biggest revenues for private investors in the energy sector still lie in conventional energy generation, public finance and national policy are instrumental for encouraging RET finance. In this context, public banks (and national development banks) play a crucial role in developing countries; for instance, in India, 74% of RET investments in 2011 stemmed from public banks (China: 69%, Brazil: 45%) (ibid.). International development banks also play an important role by providing capacity building based on their experiences. Nevertheless, the scope of investors is broad and increasingly includes the private sector, including banks, equity firms, insurance companies, pension funds, industry bodies, clean energy companies and start-up project developers. As described in the chapter above, the main barriers for RET deployment in developing countries include i) higher financial risk due to immature market structures or poor FDI environment, ii) subsidies for fossil fuels, and iii) a lack of credible policies that support renewable energy and drive down prices of electricity from renewables. Thus, governments in developing countries must assume a high responsibility for furthering RET deployment by enabling effective national policies promoting RETs and creating attractive market conditions for financiers and investors. NAMAs, or climate finance, can play an important role in this regard.

The growing landscape of climate finance

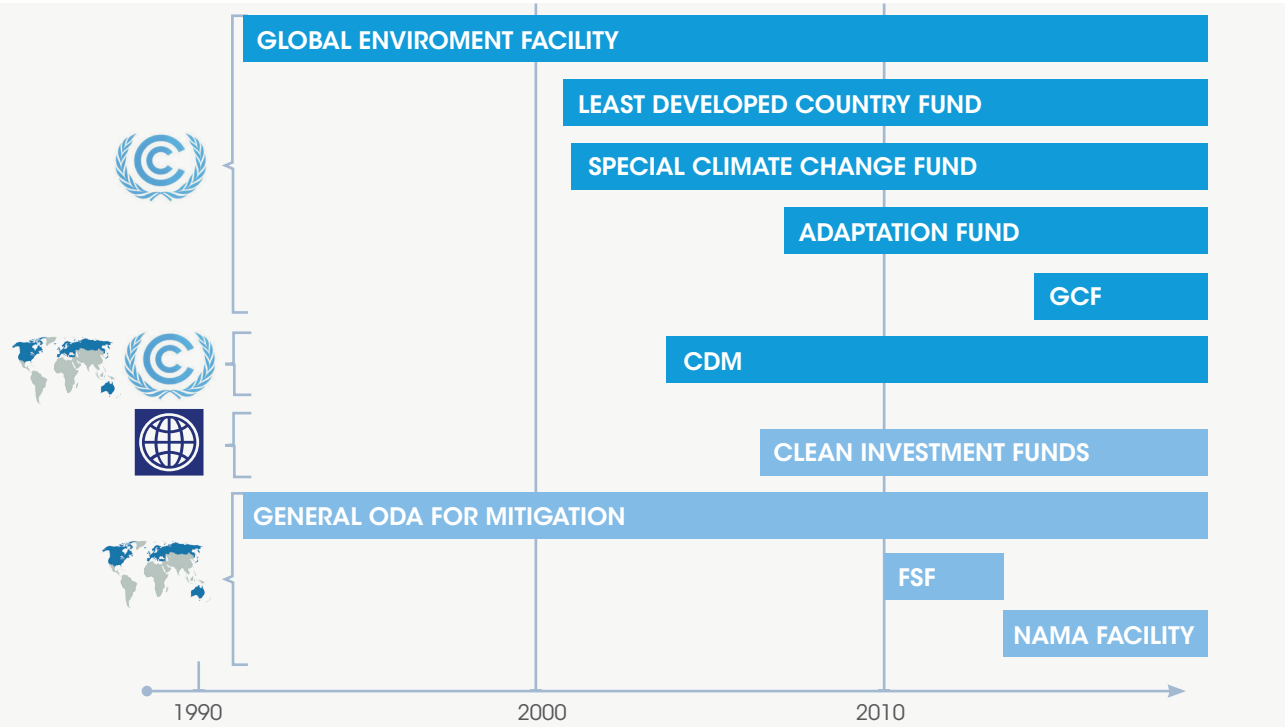
As introduced above, two types of NAMAs exist: domestically supported and internationally supported.

Generally, financing renewable energy deployment can take many forms (see Table 4). The landscape of international support options for financing GHG mitigation activities has been growing over the past decades. This progress can be tracked from the inception of climate finance with the establishment of the Global Environmental Facility (GEF) under the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. The GEF was the first multilateral vehicle for financing activities with climate benefits and continues to play an important role in the climate finance arena today. Over the 1990s, bilateral ODA streams from developed countries began to flow into mitigation activities as well. Since 2000, the topic of "climate change" has gained momentum and various multilateral funds and instruments dedicated to climate change mitigation have been established. In 2009, at the Copenhagen conference industrialised countries committed to provide Fast Start Finance (FSF) of about USD 30 billion over three years and to mobilize finance of up to USD 100 billion per year from 2020 onwards. Efforts have been gradually materialising into more concrete action. The Green Climate Fund (GCF), one vehicle foreseen to administer parts of these funds, is slowly evolving with a mobilisation of funds initiated in 2014[12] (see Figure 4). Specific NAMA support vehicles are also being established since 2013 (see Table 5 for an overview).

However, to successfully leverage the magnitude of finance necessary for addressing and combating anthropogenic climate change, a large share will need to be borne by the private sector, as scarce public resources will be insufficient (UNEP FI, 2012 and Lütken, 2013). Public and private and international and domestic financiers use existing instruments in the financing of both RET investments and NAMAs. For example, banks and financiers apply various instruments for providing

[12] *In July 2014 Germany pledged to contribute USD 970 million to the GCF, see http://www.germanclimatefinance.de/2014/07/20/finally-merkel-pledges-750-million-euro-green-climate-fund-gcf/, while in September 2014 France pledged USD 1 billion, see http://www.rtcc.org/2014/09/24/green-climate-fund-receives-1-3-billion-in-new-pledges/.*

Figure 4: Evolution of Climate Finance since 1992



Source: Authors

capital to RET projects, such a loans or project finance, mezzanine financing or refinancing. NAMA development activities consisting mainly of developing concepts and capacity building measures have often been financed by grants and, to some extent, loans. NAMAs that have reached the implementation stage rely on loans to a larger degree. For instance, in 2010, climate finance provided by international donors came largely in the form of concessional loans (58%), with non-concessional loans constituting about one third (31%). Grants accounted for only 3%, while the remaining 8% were shared by other finance instruments (Limaye & Zhu, 2012).

Obtaining finance through a NAMA framework

It is clear that NAMA financing will be as diverse as its underlying policies and measures. With the increasing number of NAMAs entering the implementation phase, the existing picture painted above could change, and a diversification process of financing instruments for NAMAs could start (see Table 4 for an indicative list of instruments that could be applied for financing NAMAs). Lütken (2013) underscores the relevance of innovative financing models for NAMAs in order to optimally capture financing from both the public and private sectors, and domestic and international levels. For example, the Chilean Self-Supply Renewable Energy (SSRE) NAMA financing model (Chapter 6) blends international and domestic sources by using international grants for enabling concessional loans for domestic actors, and tries to leverage private investments.

Despite the importance of the government and public finance for NAMAs, the aspect of leveraging private capital is of core relevance for addressing climate change. In this context, the most important tools are (Lütken, 2013):

1. Public sector regulation: Incentives (such as tax regulation or risk coverages) as well as raising public finance for NAMAs;

2. Cash flows or risk mitigation: Generating finance streams from public sector controlled cash flows (such as tax income, payments for services), as well as carbon markets or covering (partially or fully) risks for investors;

3. Private sector instruments: Tools applied by private sector financiers such as private banks (*e.g.,* equity or mezzanine finance) which would benefit from public sector regulation.

These strategies are in line with the above stated requirements for fostering RET investments in

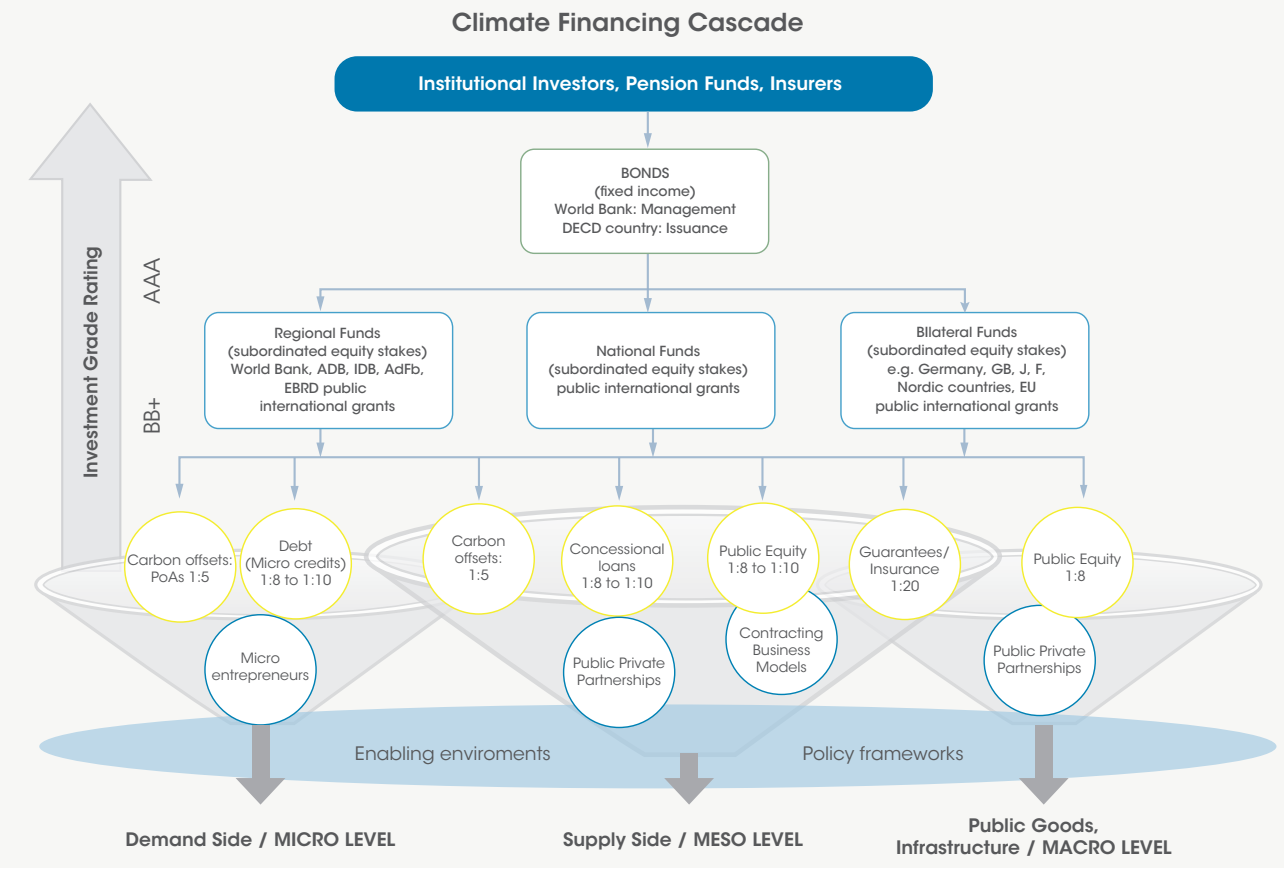
Table 4: Instruments for financing NAMAs

INSTRUMENT	SOURCE
Equity	Companies, individuals, venture funds, public venture funds (hybrids), pension funds.
First-loss	Private companies, venture funds, publicly funded venture funds (hybrids).
Loans / concessional loans	Banks, development banks, publicly funded venture funds (hybrids), pension fund.
Soft loans	Bilateral donors (through commercial banks), multilateral development banks.
Green bonds	Financial arrangers (banks and credit institutions), large corporations, governments.
Dedicated credit lines	Multilateral and bilateral development banks.
Risk cover instruments, Guarantees	Export Credit Agencies, insurance companies, banks, governments, technology suppliers.
Project Finance, including blended finance	All of the above.
Grant	NAMA Facility, bilateral donors, philanthropic funds.
Indirect: Regulatory instruments	Government, for instance from tax incentives or payments for services, as well as removal of subsidies.

Source: based on UNDP (2013)

developing countries. As instruments conceptualised and administered at the government level, NAMAs are best suited to respond to the public responsibility in shaping the environment for RET investments. Lütken (2013) advocates that the first step in NAMA financing must be a thorough screening of domestic budget lines, ideally at the sector level. The involvement of the respective mid-level governmental experts in this procedure would allow for a realistic scenario planning for strategic investments into the energy sector, and thus inform renewable energy NAMA development. GIZ (2012) have discussed the different levels and instruments involved in financing NAMAs, and illustrated them in a "Climate Financing Cascade" (Figure 5).

Figure 5: Climate Financing Cascade



Source: GIZ, 2012

Note: Yellow circles show leverage-ratios indicating the potential for leveraging of private capital

A good example of utilising a NAMA as a financing mechanism for RETs is through the use of a feed-in tariff. As developing countries move towards implementation of a national scheme for the generation of renewable energy, a technology-specific feed-in tariff guarantees producers of renewable electricity coverage of the "cost gap" associated with RETs. The feed-in tariff needs to be guaranteed over a certain extended period of time to make it financially attractive for investors.

In countries such as Germany, the feed-in tariff increases the price of electricity paid by consumers. In developing countries with a large percentage of the population lacking purchasing power, resources need to come from other sources. Such NAMAs have the potential to reduce or even eliminate electricity price increases for consumers while simultaneously providing additional benefits, such as industrial development or technology transfer. Text Box 5 illustrates a fictitious example of a NAMA feed-in-tariff.

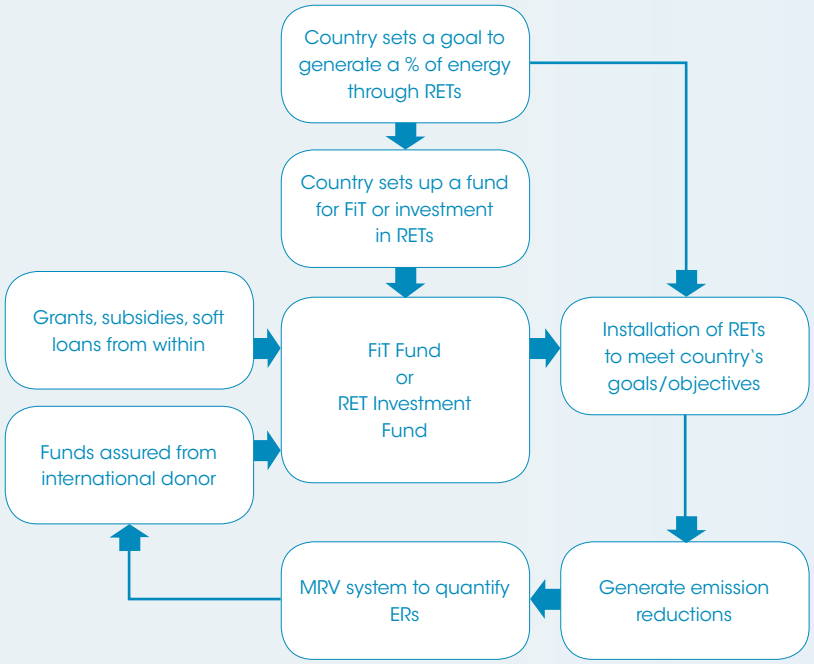
Another option of financing RET through NAMAs is indirect financial benefits. Some governments risk forfeiting revenues in the form of fuel / energy taxes (*e.g.,* fuel taxes) whereas others benefit from a reduction in fossil fuel subsidies. For the former, NAMAs can be creatively used to compensate for

Box 5

NAMAS AS A DIRECT FINANCING INSTRUMENT FOR RET

Consider the fictitious country "Namarica" that wishes to create a supportive enabling environment for the development of RETs. For this purpose, "Namarica" sets up a "Feed-in tariff/RET investment fund" to assure private investors a pool of money available to pay for the feed-in tariff 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 6: NAMA AS A FINANCING INSTRUMENT FOR RET



Source: Authors

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 renewable energy support.

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

Similarly, subsidies could be granted, not just to renewable energy energy 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.

Furthermore, financing of NAMAs could come from the carbon market, through the sale of GHG emission reduction certificates originating from policies and measures under a NAMA.[13] Providing financial incentives for NAMAs in the form of carbon credits has been proposed previously (Republic of South Korea, 2008) but until today, only unilateral and supported NAMAs have been recognised by the UNFCCC.[14] However, outside of the UNFCCC arena, the crediting of mitigation policies and measures is prominently discussed under the name "NAMA crediting", for instance by Peru, Indonesia, or Colombia under the World Bank led Partnership for Market Readiness (PMR)[15].

An important factor that has prevented the concept of NAMA crediting to gain further traction is, inter alia, the uncertainty around methodological issues, reflected also by the prohibition of policy-crediting under the CDM. From a technical perspective, the ability to credit the emission impacts of policy instruments depends on the nature of the policy. It is clear that emission credits would only accrue for reductions that have been monitored and verified, meaning that the country would have to establish a proper MRV system and pre-finance the NAMA, entailing a certain risk that the planned emission reductions do not accrue.[16] In order to ensure environmental credibility, the additionality of policies needs to be assessed. Additionality means that mitigation costs of the policies need to be positive, taking into account co-benefits of mitigation. To safeguard additionality, NAMAs should theoretically be differentiated according to their marginal abatement cost; NAMAs with negative marginal abatement costs should not be creditable. For many RET-related NAMAs, existing CDM methodologies could be used.

An important part of any NAMA support package is capacity-building measures and technology transfer. Building capacity for local policy development, implementation and evaluation activities is essential not only to increase the effectiveness of NAMAs, but also to provide donors with the confidence that NAMAs achieve their emissions mitigation objectives. Capacity-building efforts for renewable energy policies supported by development agencies, non-profit organisations 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 feed-in tariff 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.

NAMA support vehicles - Materialising support for NAMA development

Since 2013, many developed countries have put forward several initiatives for supporting NAMAs. As of September 2014, the UNFCCC NAMA registry lists 11 of such NAMA support vehicles (see Table 5).

The Anglo-German NAMA Facility is one of the most active NAMA support vehicles that also provides grant based finance for NAMAs. See Text Box 6 for a detailed description of the facility.

[13] *For a discussion on NAMA crediting see Michaelowa (2013)*

[14] *As discussed in Chapter 2, "NAMA crediting" has yet to be defined by the UNFCCC; though it is proposed by many countries for instance under the Partnership for Market Readiness.*

[15] *www.thepmr.org*

[16] *Financing options for credited NAMAs would need to be spelled out further. For instance, under the CDM there are arrangemetns which allow for upfront financing, as well as payment on delivery.*

Table 5: Overview of active NAMA support vehicles according to the UNFCCC NAMA Registry

TITLE	DONOR COUNTRY	TYPE OF ACTION	COUNTRIES SUPPORTED	SECTOR	KIND OF SUPPORT	TYPE OF FINANCIAL SUPPORT	TOTAL SUPPORT OFFERED MUSD/YR	REFERENCE
Climate-related ODA funding	Germany	Technological support, Capacity building support	All	All	Support for preparation	Grant, Concessional loan		www.giz.de
International Climate Initiative (IKI)	Germany	Support to LEDS, Development of NAMAs, Implementation of ambitious components of NAMAs	All	All	Support for preparation	Grant, Loan		www.international-climate-initiative.com
NAMA Facility	Germany and United K.ingdom	Financial and technical support to NAMAs across a range of sectors, focusing on the mobilisation of capital investments for transformational change	All	All	Support for implementation	Grant, Concessional loan	83	http://nama-facility.org/news.html
Global Environmental Facility (GEF)	GEF	Reducing or avoiding greenhouse gas emissions in the areas of renewable energy; energy efficiency; sustainable transport; and management of land use, land-use change ,and forestry	All	All	Support for preparation and implementation	Grant		www.thegef.org
Latin American Investment Facility (LAIF)	EU	LAIF supports infrastructure projects in different sectors and private sector development.	Latin America and the Caribbean	Energy supply, Transport	Support for implementation	Grant, Loan	160	www.eu-africa-infrastructure-tf.net/where/latin-america/regional-cooperation/laif/index_en.htm
EU-Africa Infrastructure Trust Fund (ITF)	EU and member countries	ITF is a fund of grant resources provided by the EU. The grant resources are blended with long-term loan financing from selected development finance institutions, helping to mobilise additional project finance and foster sustainable economic growth.	African regional projects	Energy supply, Transport	Support for implementation	Grant, Guarantee, Equity	963	www.eu-africa-infrastructure-tf.net/about/FAQ/index.htm www.eu-africa-infrastructure-tf.net/attachments/leaflet-steps-and-timing-for-submitting-a-go-for-itf-approval.pdf
Neighbourhood Investment Facility (NIF)	EU	Cover investment needs for infrastructures in transport, energy, environment and social issues (e.g. construction of schools or hospitals)	Eastern Europe, Middle East, North Africa	Energy supply, Industry, Forestry, Transport, Waste management	Support for preparation	Grant, Guarantee, Equity	332	ec.europa.eu/europeaid/where/neighbourhood/regional-cooperation/irc/investment_en.htm
Austrian NAMA Initiative	Austria	Maximum of financial support = 500,000 Euro. Funding for technical assistance and capacity building for building up the relevant institutional and regulatory capacities in eligible countries in the context of the supported NAMA activities.	Focus on Africa, LDCs & SIDS	Small-scale renewable and energy-efficient technologies	Support for preparation and implementation	Grant, preparation for carbon finance		
Support for Activities related to sustainable Management of Forests	Austria	Development of national policies and strategies for mitigating and adapting to climate change impacts on forests	Georgia	Forestry	Support for implementation	Grant	1.94	
ODA for Climate Change Measures	Japan	Development of national/local climate change policy and strategies, development of NAMA plans, implementation of individual mitigation projects including REDD+, supports for development of national GHG inventory, trainings, etc.).	All	All	Support for preparation	Grant & Concessional loan		www.jica.go.jp/english/our_work/types_of_assistance/partnership/index.html

Box 6

THE ANGLO-GERMAN NAMA FACILITY

As announced during the 2012 climate negotiations in Doha, Qatar, the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and the Department of Energy and Climate Change (DECC) of the United Kingdom (UK) jointly established the NAMA Facility. They contributed jointly an initial €70 million of funding to support developing countries and emerging economies that show leadership on tackling climate change and that want to implement ambitious climate protection measures (NAMAs). Due to the overwhelming success of the first call for projects of the NAMA Facility, BMUB and DECC will jointly contribute an additional €50 million to fund a second bidding round for NAMA Support Projects held in 2014. Germany's contribution comes from the International Climate Initiative (IKI), while the UK Government supports the Facility using the International Climate Fund (ICF).The NAMA Facility builds on previous support and addresses the demand for tailor-made climate finance by funding the implementation of ambitious country-led NAMAs, thus delivering concrete greenhouse gas reductions on the ground.

» The NAMA Facility received huge international attention.

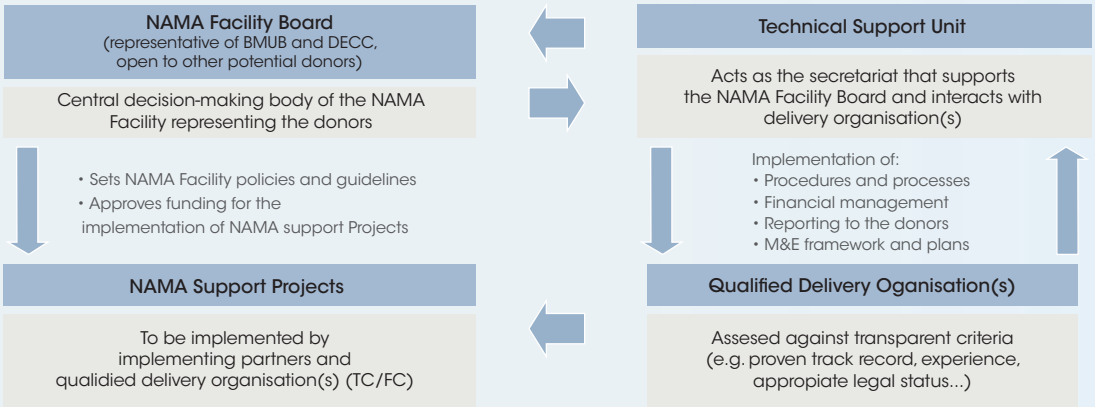
» During the first call, a total of 47 NAMA Support Project Outlines were received.

» The bids submitted had a wide geographical and sectoral coverage.

» The following NAMA Support Project Outlines have been pre-selected for funding from the NAMA Facility.

- Chile - Self-Supply Renewable Energy in Chile (SSRE)
- Colombia - Transport Oriented Development NAMA
- Costa Rica - Low Carbon Coffee NAMA
- Indonesia - Sustainable Urban Transport Program (SUTRI NAMA)
- Pre-selected projects are currently undergoing an in-depth appraisal
- The Technical Support Unit (TSU) provided feedback to all countries and delivery organisations whose NAMA Support Project Outlines were not selected during the 1st Call

Between April 7 and July 15, 2014, national governments and delivery organisations were invited to submit NAMA Support Project Outlines to the NAMA Facility´s second call. In total, 49 outlines were received. The outlines cover a large variety of sectors and all geographic regions.The Technical Support Unit will now evaluate the outlines according to the selection criteria. This evaluation includes a general check of the eligibility of the outlines as well as an assessment of the ambition and feasibility of the presented projects.The results of the second call will be communicated to the submitters of the NAMA Support Project Outlines after the conclusion of the evaluation process in the end of 2014. The governance of the NAMA Facility is displayed below:



Source: http://nama-facility.org/news.htm

5. Developing a NAMA

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

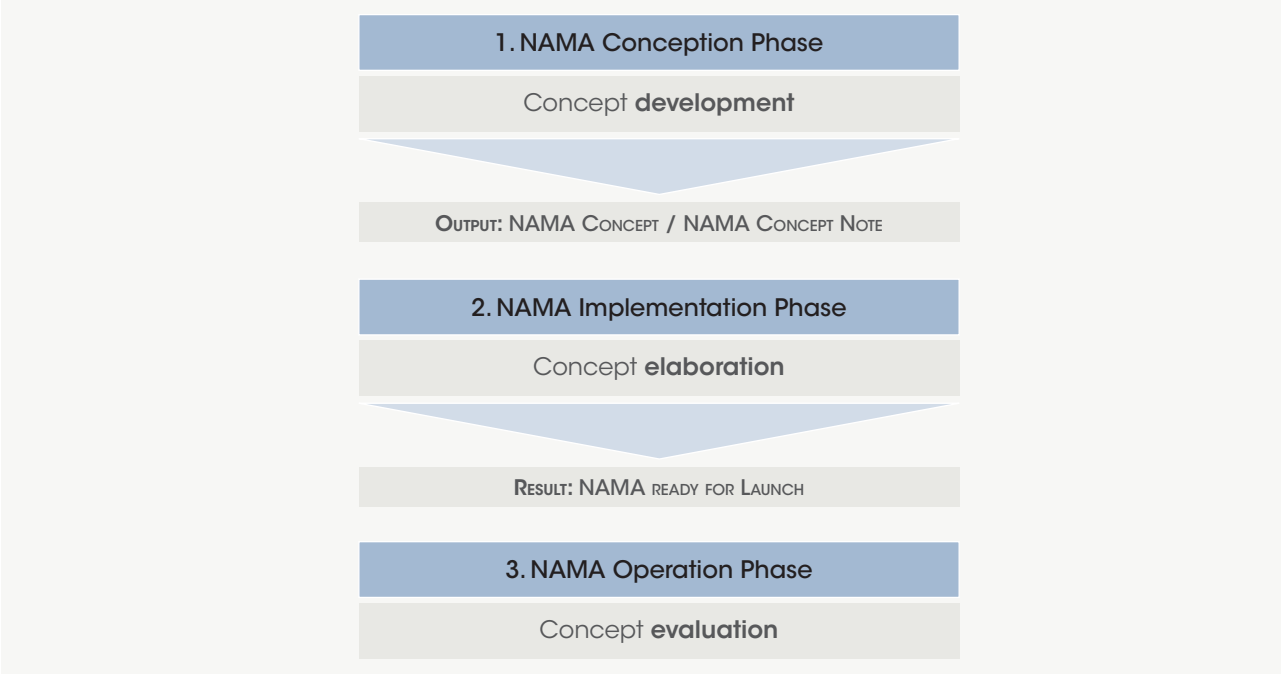
The development of a NAMA can generally be divided into the conception phase – that is the designing of the NAMA idea and shaping it into a concept – and the implementation phase – comprising the elaboration of the concept, translating it into practice and operating the underlying programme. There is no official definition for the NAMA development process; the different stages and the designations for individual steps of the NAMA evolution differ from country to country, from donor to donor and across different guidance documents.

For example, Mexico distinguishes four NAMA development stages: "NAMA idea", "NAMA design", "NAMA pilot" and "NAMA execution". On the other hand, Chile applies the categories "feasibility" and "pilot", "full scale development" and "implementation" (see case studies in Chapter 6, and Sharma, 2013). Tanzania defines a "proposal", "concept", "planning", "implementation", "operation" and "evaluation" phase. The NAMA Registry applies the categories "preparation" and "implementation" to the listed NAMAs (UNFCCC 2014a), while the NAMA database (2014) considers the stages "feasibility", "under development" and "implementation". UNDP (2013) work with three dimensions ("concept", "development" and "implementation"), whereas GIZ (2013) identifies a "LEDS context", "NAMA design" and an "MRV requirements" as major categories of the NAMA formulation process. The NAMA Facility also has a three tiered approach, which calls the conception phase "readiness", the implementation phase "appraisal", and the operation of the NAMA "implementation". Sharma (2013) identifies a concept phase, an implementation phase, as well as an operation phase.

The list can be continued, yet what is clear is that this multitude of designations for the individual steps of the NAMA development process is only logical given the absence of a centralised guidance for this still young instrument.

This handbook builds upon the definitions used in the first edition, namely (Figure 7): the conception phase,

Figure 7: Three tiered NAMA development



the implementation phase and the operation phase.[17] This definition of the NAMA development process emphasises the importance not only of the shaping of the programme, but also of operating the NAMA—a crucial stage when considering the relevance of MRV for long-term policy interventions. 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, a NAMA has the objective of reducing GHG emissions in a certain sector/area while simultaneously allowing for growth and development. The identification of renewable energy NAMAs should ideally be done through an in-depth analysis of the domestic renewable energy potential and options to trigger mitigation activities for the most promising renewables. An initial screening of existing/planned policies lays the foundation for the later scope of the NAMA, identifying 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 information on low carbon/emission development strategies, which provide a good foundation to carve out the NAMA scope. Furthermore, the coordinating entity for the NAMA (the "NAMA coordinator", see description below) should understand the barriers for certain policies and conduct an assessment on how to overcome these 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;
- Identification of relevant stakeholders;
- Baseline establishment and future mitigation scenarios;
- Potential barriers preventing the implementation of these policies;
- Required resources and solutions to overcome these barriers; and
- Potential co-benefits beyond pure GHG emissions reductions.

Note that the NAMA initiative need not come from the host country government, but can also be initiated by domestic or international actors (*e.g.,* public sector, private sector, development agencies, and multilateral donor agencies). Nevertheless, consistency with national development priorities – that is national ownership – in NAMA development is essential, even in cases where the NAMA initiator is not representing the public sector. Many countries are applying national prioritisation processes, for instance in the context of their low emission development strategies, which then could be used for NAMAs.

The low carbon/emission development strategies process supported by the World Bank and the U.S. Department of Energy, for example, could be applied to the development of NAMAs.[18] Many developing countries have started developing their low carbon frameworks / development strategies (LCDS). However, only some countries have applied a detailed and thorough process of transitioning LCDS towards NAMA identification – a good example is Colombia[19]. An interesting resource that can provide a broad overview of existing policies and strategies to support the initial scoping for a NAMA is the IEA/IRENA database for renewable energy policies and measures.[20]

The example from the Philippines (Text Box 4) illustrates how a NAMA can be aligned to national development priorities. In the context of the national target for increased renewable energy capacity by 2030, a NAMA was formulated for financing private sector participation to renewable energy development in the Philippines. This NAMA is in line with the objective to develop, implement and institutionalise support mechanisms to encourage private sector participation towards accelerated renewable energy development in the country. The case from Uruguay (Text Box 2) also shows how a NAMA can serve as an instrument that contributes

[17] *Note that, as of September 2014, only seven NAMAs have reached the implementation phase while none have started their operation yet.*

[18] *The experiences in six large developing countries are available at: http://sdwebx.worldbank.org/climateportalb/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.*

[19] *The Colombian Low Carbon Development Strategy helped identifying several NAMAS and low carbon policies, prioritized and compiled for each sector through the Sectoral Mitigation Action Plans.*

[20] *Available at: http://www.iea.org/policiesandmeasures/renewableenergy/*

to national development goals while simultaneously achieving GHG emissions reductions.

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 NAMA Registry. 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 framework is implemented and launched, the operation phase, in which the NAMA is conducted and evaluated, begins. Since NAMAs often represent domestic policies or strategies, one should consider the usual lead and implementation timespans required for the related policies in the host country. Hence, the time required for converting a NAMA idea into practice can be significant. Timelines can be even longer if international support comes into play, as this aspect may make the process more complex.

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, such as an inter-ministerial NAMA office, or an institution, such as a unit in the Ministry of Environment or as in the case described in text box 3, in which the NAMA on supporting implementation of 100% renewable energy by 2020 in the Cook Islands was coordinated by the national Renewable Energy Development Division (REDD). 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 and report its progress to the government. The tasks of the coordinator may include the administration of the NAMA conception and implementation; elaborating the MRV architecture; developing the documentation; coordinating involved public and private institutions, stakeholders and technical experts; and/or managing the interaction with the UNFCCC and donors.[21]

Besides the NAMA coordinator, the process of developing a NAMA will involve a plethora of governmental, public and international actors, with the nature of their involvement dependent on the design of the envisaged NAMA. Furthermore, according to the choice of activities covered by the NAMA and their respective designs, various stakeholders may be positively or negatively affected by the implementation of the NAMA. These stakeholders 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 also build on existing initiatives and platforms that have been set up to encourage stakeholder engagement in other contexts. If required, identification could take place in 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 6[22]:

5.1 THE NAMA CONCEPTION PHASE

As more and more NAMA initiatives have been put forward, NAMA development over the last few years has become less challenging. Today there is a generic understanding of NAMA elements and purposes. However, there is still limited guidance regarding how standards for NAMA development can be framed, particularly with regards to the NAMA documentation of the concept, estimated emission reductions and the MRV system and support framework. The NAMA conception phase has to compile a broad range of information that usually naturally results in a comprehensive NAMA documentation. Ideally, this process would be formally documented in a NAMA Concept Note, as well as in a more comprehensive NAMA Concept Study.

[21] *See a GIZ publication on integrating sub-national actors in NAMA development processes at http://mitigationpartnership.net/sites/default/files/giz2013-en-sub-national-involvement-nama_0.pdf*

[22] *Based on UNDP (2013)*

Table 6: Possible Stakeholders Involved in NAMAs

Governmental	Ministries responsible for regulation of the proposed policies and/or measures.
	Other relevant line ministries which can have a central role for NAMA development.
	Energy regulators.
	Sub-national (*i.e.* 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 Organisations and civil society	Non-Government Organisations 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

Figure 8 illustrates components of the NAMA conception phase. Before the concept can be elaborated, the NAMA coordinator needs to clearly identify 1) the objectives of the NAMA and 2) the scope of existing and planned national policies. As described above, for NAMA scoping, the initiating or coordinating 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, 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 renewable energy 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) and their respective environmental benefits, co-benefits, financing instruments 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 September 2014, no universally endorsed template for a concept study had been produced. It is therefore important that the content complies with both the recommendations of the UNFCCC and with the requirements of potential donors. Numerous formats, templates and standards for NAMA Concept Notes have been released by various NAMA stakeholders since 2011. In mid-2012, the UNFCCC published templates for NAMA Concept Notes seeking support for preparation and implementation[23]. That is the template used in this Handbook.

Table 7 provides an illustrative example for a NAMA Concept Note.

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

Figure 8: NAMA conception phase

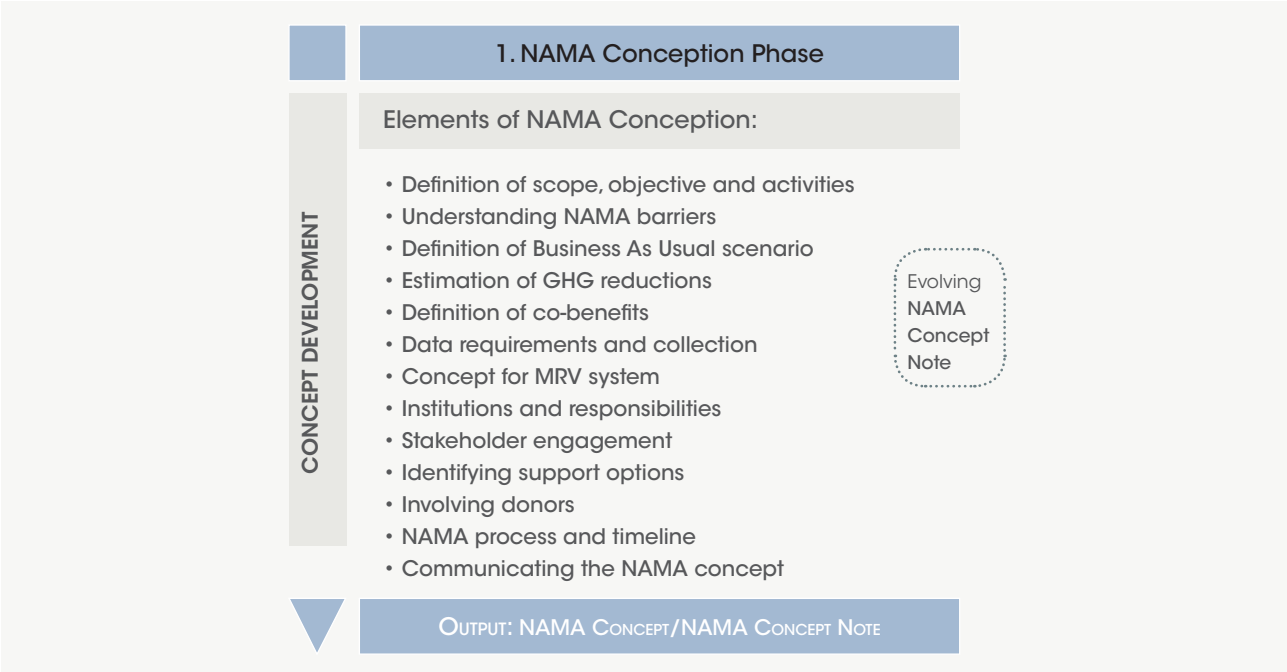


Table 7: Fictitious Example of a NAMA Concept Note

NAMA CONCEPT NOTE	
Party	Namastan
Title of mitigation action	Feed-in Tariff for renewable energy in Namastan
Sector	Energy Supply
Technology	Bioenergy, solar energy, wind energy, geothermal energy
Type of action	National/sector-level policy or program
NAMA coordinator	Ministry of Energy of Namastan
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	Ten 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 Grant: USD 500,000 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, jobs created
Benefits for local sustainable development	Improved energy security, job creation in renewable energy sector, decreased local air pollution

Source: Based on UNFCCC (2012a)

As shown in the fictitious NAMA concept note, the following elements are crucial for the NAMA concept:

Definition of NAMA Objective, Scope and Activities. Once the potential sectors or fields for potential NAMAs 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 objective or envisaged outcome of the NAMA (*i.e.,* mitigation and co-benefits)?
- 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. As described in Chapter 3, RET deployment faces various political, economic, financial, legal, regulatory, technical, institutional and even cultural barriers. 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[24] or UNDP (2013). A definition of how barriers can be assessed on a project level is also available in specific CDM guidelines.[25]

Definition of the Business-As-Usual Scenario. To evaluate a NAMA's environmental benefits, it is essential to understand the baseline scenario—the emissions that would have occurred in the absence of the NAMA action, also called the "Business-As-Usual" (BAU) scenario. This baseline is 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, dependent on their energy pricing, available energy resources, 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 sector-level baseline setting.[26] 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).[27] 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,[28] may be considered. Note that CDM methodologies mainly follow a single project approach and thus may not be appropriate to assess baselines of broad policies and measures introduced under a NAMA. However, on-going standardisation efforts under the UNFCCC may make CDM methodologies much more appropriate for baseline setting under NAMAs.

Definition of Estimated Emission Reductions. A NAMA's mitigation effect is defined as 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 a good basis for estimation of emission reductions under a RET NAMA.[29]

Definition of Co-benefits. Besides the pure abatement effects, NAMAs may generate co-benefits. These will most likely include sustainable development benefits, such as economic benefits (*e.g.,* an increased number of jobs), environmental benefits (*e.g.,* reduction in water consumption) and social benefits (*e.g.,* reduction of indoor smoke from fossil-fuelled cook stoves). Specific

[24] *See http://www.tech-action.org/Guidebooks/TNA_Guidebook_OvercomingBarriersTechTransfer.pdf.*
[25] *http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid38.pdf.*
[26] *See http://www.oecd.org/environment/climatechange/47857020.pdf.*
[27] *Available at http://www.esmap.org/esmap/EFFECT.*
[28] *http://cdm.unfccc.int/methodologies/index.html.*
[29] *http://cdm.unfccc.int/methodologies/index.html.*

impact assessments should be conducted. See, for example, the European Sustainability Network[30] or an OECD discussion on impact assessments.[31] UNEP DTU offers a discussion on indicators, procedures for stakeholder involvement and safeguards against negative impacts of NAMAs, based on a review of experience with the CDM's contribution to sustainable development.[32]

Data Requirement and Collection. The NAMA development will require a huge amount of data, starting with the scoping exercise, the baseline setting, the calculation of NAMA emissions, to the associated 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 more comprehensive MRV requirements (for instance from international donors). Unilateral NAMAs will need to provide data for Biennial Update Reports under the UNFCCC. For renewable energy-related NAMAs, information should initially be requested from the national renewable energy related authorities. It can be complemented by sources such as IRENA country profiles and overviews, such as REN21 (2014a).

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 involve 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 remains unclear and undefined under the UNFCCC. In general, reporting requirements will exist at the different levels, *i.e.,*

- At the national level (*e.g.,* budget commission),
- At the international level (*e.g.,* Biennial Update Reports under the UNFCCC that determine minimum requirements on NAMAs reporting), or
- Donor requirements (*e.g.,* regular monitoring and evaluation).

Existing domestic practices for reporting to the UNFCCC should be reflected in NAMA reporting. Domestically funded, unilateral NAMAs should allow for flexibility and cost-efficiency in terms of MRV. 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, as well as including methods for other indicators such as indicators on co-benefits.

A straightforward MRV approach measuring energy consumption / savings per house was taken by the Mexican housing NAMA, as described in the case study in Chapter 6. Further reading on MRV for NAMAs is available from UNEP DTU,[31] on the website of the International Partnership on Mitigation and MRV[32], and in UNDP (2013).

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;

[30] *http://www.sd-network.eu/?k=quarterly%20reports&report_id=5.*

[31] *http://www.oecd.org/greengrowth/48305527.pdf.*

[32] *http://www.unepdtu.org/-/media/Sites/Uneprisoe/Publications%20%28Pdfs%29/SD%20impacts%20of%20NAMAs_LCD_WP11_FINAL.ashx*

- 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.

Mobilising 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 during NAMA implementation.

A handbook for stakeholder engagement in developing countries (from a business perspective) has been provided by the International Finance Cooperation (IFC)[33]. A stakeholder analysis toolkit is available from the Overseas Development Institute[34].

Developing a NAMA Financing Concept. A financing concept for the NAMA needs to reflect the costs of the envisaged action, the available sources and potential instruments, and the requirements from external support sources (see also Chapter 4). A thorough assessment should be undertaken to identify the 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. UNDP (2013) summarises the requirements for a mature NAMA financing proposal, outlining that it should, at a minimum, consist of the following elements:

- **Cost-benefit overview:** The total costs of implementation (if possible, by illustrating alternative scenarios) of the planned measure(s), indication of the direct benefits, including emissions-reduction benefits, as well as co-benefits.
- **Financial instruments:** Information on potential financial instruments to be employed and the conditional requirements for each.
- **Governance**: Identification of a domestic authority that serves as the communications partner and, if applicable, a financial aggregator. Financial aggregators are the stakeholders involved in structuring the NAMA financing and may also be capable of facilitating the implementation process.
- **Major risks and barriers:** Identification of likely obstacles that may threaten cash flows and delay or hinder the implementation and successful operation of the NAMA.
- **MRV system:** This is necessary documentation that helps to justify involvement in climate financing.
- **Domestic and international support:** Financing that is provided through the national budget should be highlighted. Additional financial instruments sought from other sources including the private sector should be described, if possible, providing alternative approaches.

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 financiers and international investors or donors. NAMA costs need to be identified, carefully calculated and substantiated with credible data.

For an example of how incremental costs were defined for a NAMA and how international NAMA support can be utilised to leverage private sector investments, refer to the Chilean SSRE NAMA case study (Chapter 6).

To estimate the financial support requirements of NAMA activities, the costs of related projects that have already been implemented can be taken into account. Here the United Nations Development Programme (UNDP) methodology for national assessments of investment and financial flows[35] 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[36] Furthermore, a comprehensive discussion of financing options for mitigation activities is provided in a GEF/UNEP guidebook[37]. A tool on de-risking renewable

[33] *http://www.uneprisoe.org/upload/unep%20ris%C3%B8/pdf%20files/unep%20ris%C3%B8%20mrv%20nama%20primer.pdf.*

[34] *http://www.mitigationpartnership.net/.*

[35] *http://www.ifc.org/ifcext/enviro.nsf/attachmentsbytitle/p_stakeholderengagement_full/$file/ifc_stakeholderengagement.pdf.*

[36] *http://www.odi.org.uk/resources/details.asp?id=5257&title=stakeholder-analysis.*

[37] *http://www.undpcc.org/en/financial-analysis.*

energy NAMA investments was released in 2013[38], and a guidebook on NAMA development by IISD contains a section on identifying barriers for financing NAMAs[39]

Information for conducting technology needs assessments has been provided by the UNFCCC in its Technology Needs Assessment (TNA) Handbook[40], while TNAs and Technology Action Plans are being published by the UNEP TNA project[41]

Involving Donors. As described above, NAMA finance will initially come from public domestic sources, such as NAMA facilities (see Chapter 4 above). All such NAMA support vehicles have distinct support criteria and offer different types of funding (from grants to loans). The authorities administering these funds need to be contacted to identify NAMA funding possibilities. Based on a screening of sector specific budget lines in the national budget, realistic estimations of international support requirements can be made. 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"[42].

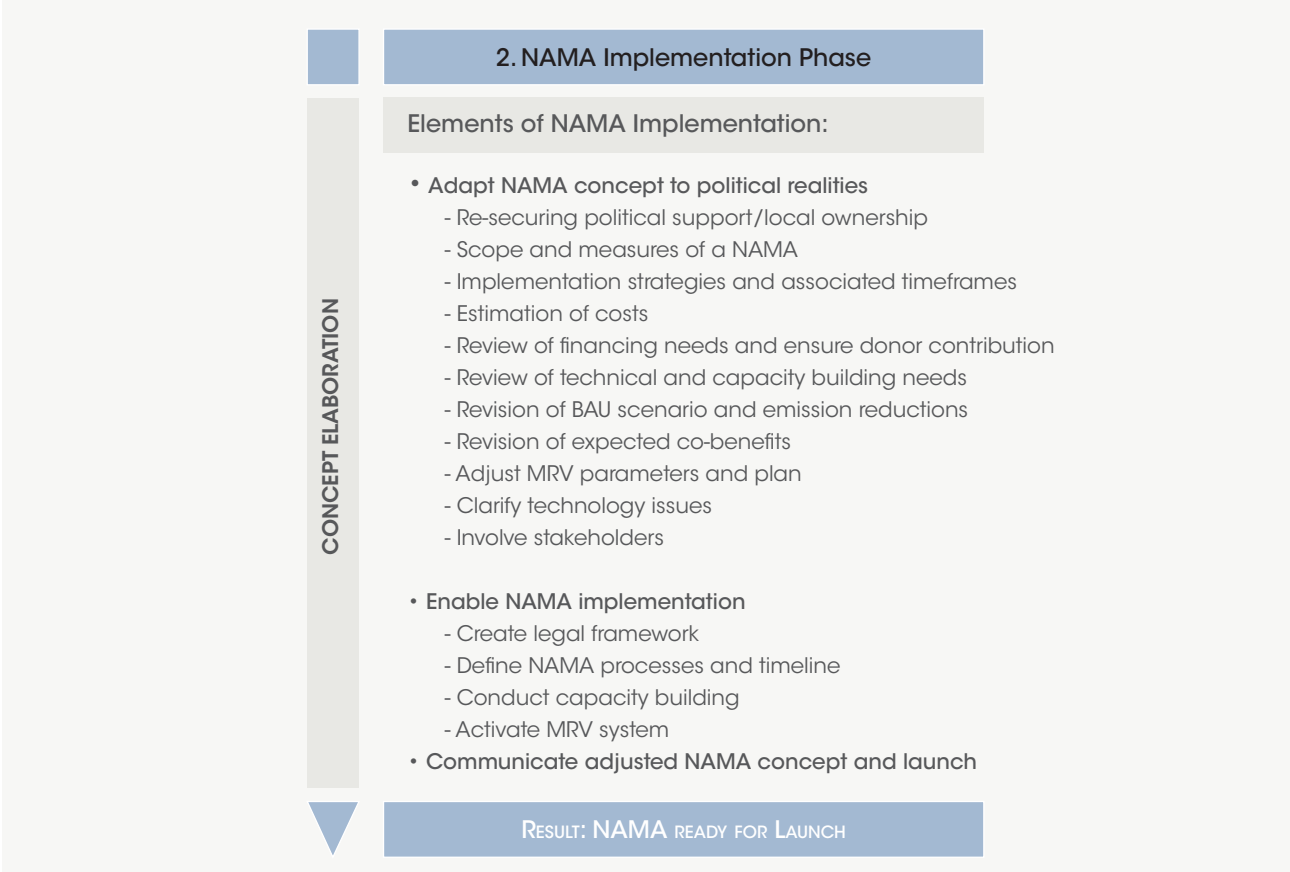
Defining the NAMA Process and Timeline. The NAMA coordinator should define the process from the initial NAMA idea to the individual activities in the operation phase. Also, the envisaged NAMA lifetime, the estimated conception time, roll-out and, if applicable, a periodic approach for the operation should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

Communicating the NAMA Concept. The NAMA concept may be uploaded to, or updated in, the UNFCCC NAMA Registry. This will permit "marketing" the NAMA, which will be particularly important for obtaining the required support.[43]

5.2 NAMA IMPLEMENTATION PHASE

Based on the NAMA concept study and note, the host country government can decide whether to move the NAMA from the conceptual into the implementation stage. 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 will also be required to enable the implementation process within the host country as outlined in Figure 9.

Figure 9: NAMA Implementation Phase



[38] http://www.esmap.org/esmap/MACTool.

[39] http://tech-action.org/Guidebooks/TNA_Guidebook_MitigationFinancing.pdf.

[40] http://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Climate%20Strategies/UNDP%20Derisking%20Renewable%20Energy%20Investment%20-%20Full%20Report%20%28April%202013%29.pdf

[41] http://www.iisd.org/pdf/2013/developing_financeable_namas.pdf

[42] http://unfccc.int/ttclear/pdf/TNA%20HANDBOOK%20EN%2020101115.pdf.

[43] http://tech-action.org/.

Adapting the NAMA Concept to Political Realities. As the policy implementation draws closer to realisation, stakeholder (including government) interest will become increasingly dynamic. The government, other concerned actors, or changes in national/international policy frameworks or NAMA objectives may require the NAMA coordinator to revise and adjust the NAMA before implementation. 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 timeframes;
- Revision of the cost estimates (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
- Engagement with stakeholders to understand their position and ensure commitment, and establish a clear institutional arrangement with a clear delineation of responsibilities of each stakeholder.

The NAMA coordinator should be prepared to revise the NAMA concept, accepting that such revisions may cause considerable departure from the original design. Adjusting the NAMA concept for implementation is likely to be time consuming, and a close interaction with the relevant governmental 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[44].

Enabling NAMA Implementation. Smooth NAMA implementation will require specific steps, 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 renewable energy, 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 estimate the amount of time required for the relevant framework to be implemented, the legal processes and actors involved, and the potential risks and challenges of the process. Setting up a pilot phase could help overcoming institutional barriers in this context.

Setting up the NAMA management will involve the identification and training of 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 organisations, such as the GEF or the World Bank).

Furthermore, it will be important to implement the MRV system and to ensure that the monitoring and reporting procedures are ready for launch and that the verification process will function.

The OECD discusses success factors for enabling frameworks in connection with "green growth" in developing countries[45].

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.

5.3 NAMA OPERATION PHASE

Once the NAMA has been launched—that is, the legislation has been completed and the policies/measures operationalised—it is important to administer the NAMA according to the management procedures defined in the NAMA conception and implementation phase, particularly with regards to the MRV system. In order to capture all lessons learned from the NAMA experiences, an evaluation process should be initiated immediately

[44] *http://www.climatefinanceoptions.org/cfo/index.php.*

[45] *See http://www4.unfccc.int/sites/nama/SitePages/Home.aspx.*

following operation. Figure 10 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 consist of 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. Depending on the degree of support, the verification of the NAMA can be conducted by an independent verification entity, a team of international experts under the International Consultation and Analysis, or by domestic auditors.

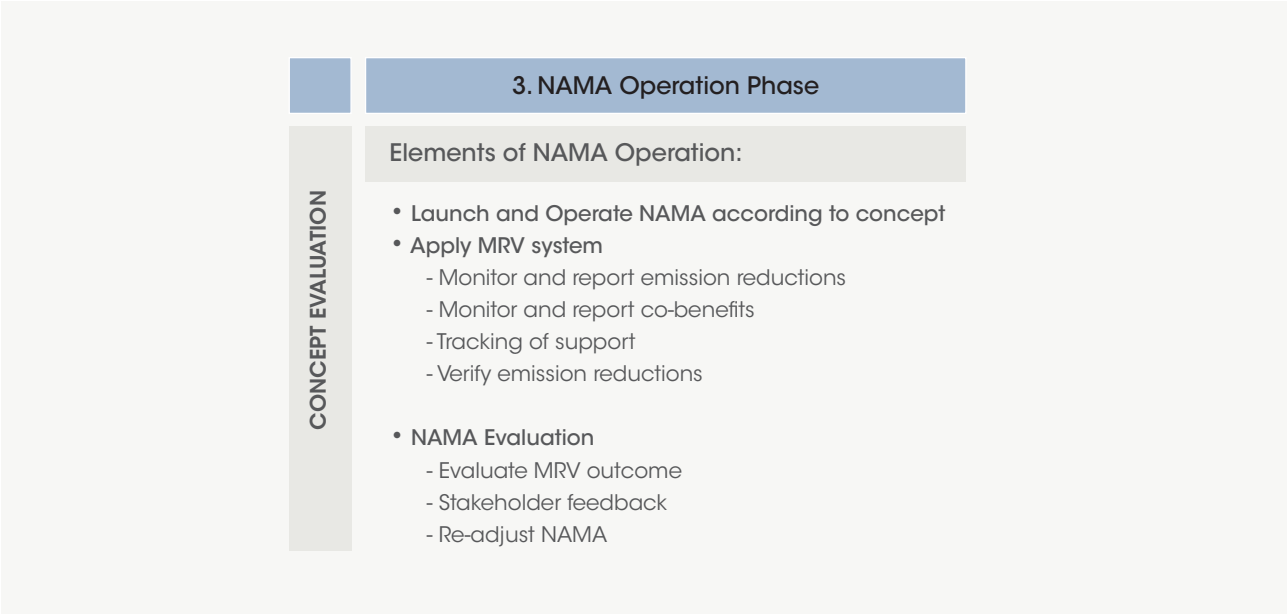
Governmental reporting procedures and financial management systems, as well as the donor reporting requirements as agreed with the host country, should be considered when tracking financial and technical support and capacity building. Donor and government spending could be combined into one report and 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 including the date, topic and number of involved participants should be made transparent. Any sort of guidance documents and their purpose needs 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; compare the real with the envisaged impacts; invite feedback from all stakeholders, experts and donors; and adjust the NAMA concept accordingly. This adjustment may require substantial efforts to vitalise 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 timeframe.

Figure 10: NAMA Operation Phase



6. Case Studies: The Role of Renewable Energy NAMAs in Selected Developing Countries

This chapter explores the RET potential and the possible role of NAMAs for countries of varying size through three case studies: Tunisia, Chile and Mexico. Each case provides an overview of the country's energy profile, institutional frameworks for the energy sector and climate change initiatives, governmental RET regulation and policies, financing options for renewable energy projects and challenges to renewable energy deployment. In addition, an overview of the domestic plans for NAMA development is provided. This general overview is followed by an illustrative NAMA case for each country: Tunisia's Solar Plan NAMA, which aims to implement a large-scale solar PV deployment programme; Chile's Self-supply Renewable Energy NAMA, which outlines opportunities to support self-supply through renewable energy in the agro (livestock, dairy, fruit and wine), retail (supermarkets and shopping centres), and tourist (hotels) industries; and Mexico's NAMA for Sustainable New Housing, which promotes cost-effective energy-efficient building concepts – including solar PV components – across the residential housing sector and is one of the most mature NAMAs today. Lessons learnt from each of these NAMAs are then reflected within the context of the host country´s circumstances. Key messages from the cases are summarised below.

NAMAs can play a central role in creating an **enabling environment** for renewable energy, in particular:

- They can help achieve broader energy policy targets, as demonstrated by the Chilean case study;
- They are perceived as an important vehicle for mobilising political support for renewable energy, as the examples of Mexico and Chile show. Still, interest of political actors is a necessary but insufficient requisite for smooth NAMA development; as underscored by the long development timeline experienced in Tunisia;
- NAMAs can complement the activities of existing climate policy instruments, such as the Clean Development Mechanism (CDM).

Moving a NAMA from a feasibility study to actual **implementation** is a challenging undertaking. In particular, policy makers and NAMA developers should consider that:

- NAMAs can only be realised if they are consistent with existing domestic regulatory frameworks and are supported by the appropriate governmental institution. The lack of host country ownership was a contributing factor to the Tunisian NAMA's long lead time;
- NAMAs need to be in-line with the national (development) priorities and strategies. In national debates, often the co-benefits are more important than the GHG emission reductions;
- A centralised NAMA management structure and careful design, both in the concept and implementation stages, is helpful in ensuring alignment with national strategies. The Chilean and the Mexican NAMA cases provide helpful insights in this regard;
- Data availability and transparency are necessary to ensure a robust MRV system for the NAMA.

With NAMA development gaining momentum, the focus is now shifting towards **NAMAs financing**. Developers and policy makers should consider that:

- NAMAs can allow access to new sources of financial support for renewable energy projects and programmes potentially through initiatives such as the Green Climate Fund;

» International financing is limited in scope and can be linked to a number of conditions, including the transformational nature of the NAMA; the stringency of Measurement, Reporting and Verification (MRV); or the transparency of policy processes. Even for the well-defined NAMAs in Chile and Mexico, acquisition of international support was a time consuming process;

» Involvement of financial actors is recommended to enable leveraging private sector finance and the use of adequate financial instruments in order to maximise benefits of scarce public funds, such as the case of the Chilean NAMA.

6.1 CASE STUDY: TUNISIA

SUMMARY

Tunisia faces a rapidly growing energy demand and the country is highly dependent on energy imports, especially natural gas, which accounts for the vast majority of electricity production. Despite the decreasing trends in costs, RETs are not yet competitive in Tunisia due to several factors, including energy pricing structures, lack of supporting policy frameworks and a less developed RET supply chain. Renewable energy plays a minor role in the national energy mix, apart from its limited deployment in the residential sector. Nevertheless, the country has set ambitious long-term renewable energy targets, putting forward a large-scale development plan for renewable energy (Plan Solaire) in 2009.

Despite initial programmes introduced by the government, the basic national regulatory framework and existing financial opportunities, RET deployment still faces significant technical, financial, institutional and regulatory barriers in Tunisia. In this context, the country has initiated the development of a Plan Solaire NAMA for faster RET deployment, with support from various international players and the involvement of numerous national actors. So far, despite the long lead time and detailed efforts, no breakthrough has been achieved in advancing the Plan Solaire NAMA. There are various reasons for this development, with the ongoing changes in the political landscape over the last 5 years being an essential one. Also, the changing involvement of different domestic actors, donors and consultants, as well as a restructuring of government institutions led to the reformulation of the NAMA on several occasions.

Experience with the Plan Solaire has shown that its development hinges on support from certain government actors, while, at the same time, the interests of conventional energy industry actors have to be taken into account. The use of NAMAs as an instrument has been pursued for different sectors in Tunisia, with buy-in from high government officials. However, active support came mainly from the middle management in government institutions outside the key ministries. It is likely that NAMA implementation under the current conditions will require more time and will potentially need backing from external partners to ensure successful mitigation action. Nevertheless, if properly designed and supported by the government, NAMAs have the potential to overcome barriers and challenges for renewable energy deployment in Tunisia.

Energy Profile: Tunisia

Current situation

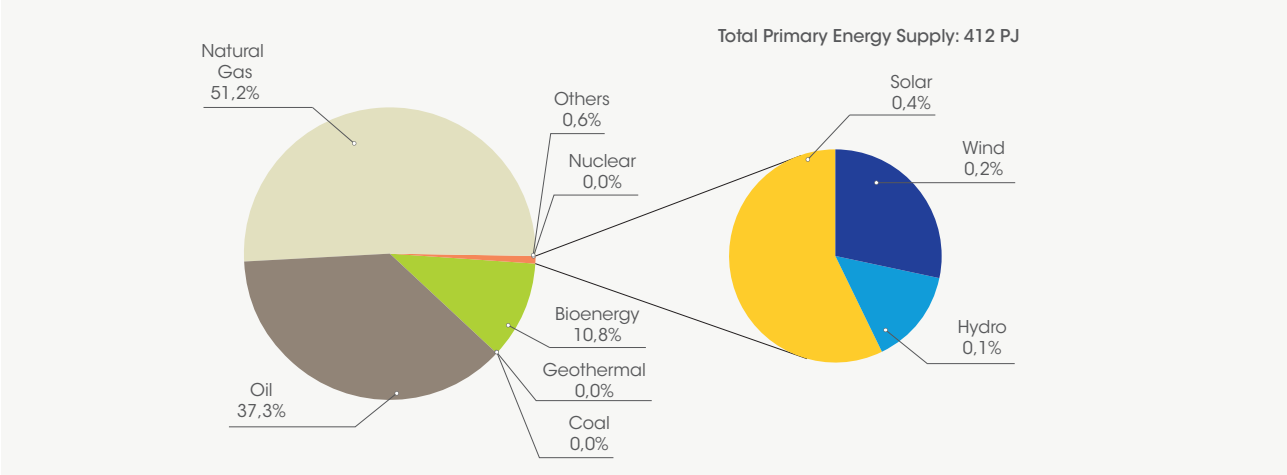
The energy sector is the largest source of GHG emissions in Tunisia, constituting more than 50% of the nation's GHG emissions.[46] In 2012, the installed capacity was 4,043 MW, of which renewable energy had a share of 5.5%. This breaks down into 104[47] MW of wind, 66 MW hydro and 4 MW of installed PV capacity (GWEC, 2013 and RCREEE, 2012). Total primary energy supply in 2012 was dominated by fossil fuels, mainly natural gas (51% in 2012) and oil (37.2%) (Figure 11). Power generation reached 18 TWh[48] in 2012, with a share of 1.7% for renewable energy (IEA,

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

[47] *http://www.oecd.org/dac/environmentanddevelopment/50559116.pdf.*

[48] *The most recent Tunisian GHG inventory was published in the Second National Communication (Ministère de l'Environnement et du Développement Durable, 2013) and gives a share of 55% for the energy sector.*

FIGURE 11: SHARES OF TUNISIA'S TOTAL PRIMARY ENERGY SUPPLY IN 2012



Source: IEA (2014b)

2014a). Tunisia has reached a national electrification rate of 99.6% (IRENA, 2014b and STEG, 2014).

Almost 100% of the electricity generation is from natural gas, of which 49.2 % are imported in 2012 (IEA, 2014a). Tunisia receives natural gas as a royalty for transit fees from the Trans-Mediterranean Pipeline "Enrico Mattei", which transports natural gas from Algeria through Tunisia (EIA, 2014a). The domestic oil production is steadily decreasing.

Between 2000 and 2010, electricity prices have increased by around 10%. In order to cover production and distribution costs of electricity and natural gas, the government directly and indirectly subsidises the Tunisian Electricity and Gas Company (Société Tunisienne de l'Electricité et du Gaz, STEG) to maintain prices at socially acceptable levels (Benedetti et al., 2013).[49] However, recent initiatives to reduce public deficit have led to a reduction in subsidies.[50]

Future energy profile

The Tunisian government expects a rapidly growing energy demand and envisages to increase the share of installed renewable energy capacity to 40% by 2030, with 17% wind, 15% PV, 5% CSP and 3% biomass (RCREEE, 2012). The objective is for electricity generation from renewable energy to grow to a share of 11% by 2016 (IRENA, 2014b) and 30% by 2030 (PMR, 2014a). IRENA indicates a "high" potential for wind, solar, and hydro; a "medium" potential for biomass; a "low" potential for ocean-based RETs (IRENA, 2014b).

Institutional framework: Energy

The most relevant actors in Tunisian energy policy with regards to electricity production are the

- Ministry of Industry, Energy and Mining;
- Ministry of the Environment and Sustainable Development;
- Commission Supérieure de la Production Indépendante d'électricité – (CSPIE) (High Commission for Independent Power Production);
- Commission Interdépartementale de la Production Indépendante d'électricité – (CIPIE) (Interdepartmental Commission for Independent Power Production);
- Agence Nationale pour la Maîtrise de l'Energie – (ANME) (National Agency for Energy Conservation) and
- Société Tunisienne de l'Electricité et du Gaz – (STEG) (Tunisian Company for Electricity and Gas).

Since 1962, the production, transport and distribution of electricity in Tunisia have been exclusively controlled by STEG, a government entity overseen by the Ministry of Industry, Energy and Mining. Only since 1996 are independent power producers (IPPs) eligible to produce electricity under concession and for exclusive sale to STEG but are constrained to using natural gas.

[49] *This figure is based on an estimate by GWEC (2013). Other sources such as RECREE (2012) indicate that the wind capacity in 2012 was 154 MW.*

[50] *Terawatt hours*

Two major IPPs are currently under operation: one 471 MW combined cycle plant in Radès that started its commercial production in May 2002 and one 27 MW gas fired plant in El Bibane. In addition to IPPs, self-producers generate electricity for their own consumption and sell their energy surplus to STEG (0.5% in 2010); they can use RETs.[51]

The ANME was established in 1985 under the Ministry of Industry, Energy and Mining with the objective to execute governmental energy policy focusing on renewable energy and energy efficiency. ANME´s scope of work covers all initiatives and actions that aim at improving the level of energy efficiency and diversifying energy sources.[52] For the establishment of progressive RET support policies, the most relevant actors are thus STEG and the Ministry of Industry, as well as ANME.

Institutional framework: Climate change

Tunisia was among the first countries in the Middle East and North Africa (MENA) region that actively stated their commitment towards fighting anthropogenic climate change. The country ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1993 and the Kyoto Protocol in 2002. In early 2014, Tunisia approved its new constitution, which, under Article 44, obliges the country to "guarantee a sound climate and the right to a sound and balanced environment" and "provide the necessary means to eliminate environmental pollution" (PMR, 2014), making Tunisia the third country worldwide to recognise climate change in its constitution.

Under the auspices of the Ministry of Industry, ANME is currently coordinating all efforts related to mitigation and the GHG inventory in the energy and industry sector. Moreover, ANME is set to become the main institution overseeing the implementation of climate policy instruments in the energy and cement sectors. The CDM Designated National Authority (DNA) is hosted by the Ministry of the Environment and Sustainable Development.

Governmental RET regulation and policy

In the mid-1990s, Tunisia started to liberalise its energy market. While the existing legal framework of Tunisia

Table 8: RET Support Policies & Measures in Tunisia

TITLE	START YEAR	POLICY STATUS	POLICY TYPE	POLICY TARGET
The Decree on connection and access of renewable electricity to the national grid	2011	In force	Policy Support, Regulatory Instruments, Codes and standards	Multiple renewable energy sources including bioenergy, wind, solar
Tax exemptions for the import of renewable energy and energy efficiency equipment materials (Decree 2010/1521)	2010	In force	Policy Support, Strategic planning, Regulatory Instruments, Codes and standards, Economic Instruments, Fiscal/financial incentives, Feed-in tariffs/premiums, Tax relief	Multiple renewable energy sources, including chp, cooling, heating, heat pumps, wind
Decree on rules of selling renewable electricity to the Tunisian Company of Electricity and Gas (STEG)	2009	In force	Policy Support, Regulatory Instruments, Economic Instruments, Codes and standards	Multiple renewable energy sources including bioenergy, solar PV, wind
Law 2009-7 on Energy Efficiency: Renewable Energy Provisions	2009	In force	Regulatory Instruments, Codes and standards, Economic Instruments, Fiscal/financial incentives, Grants and subsidies, Policy Support, Institutional creation, Monitoring, Auditing	Multiple renewable energy Sources.
Tunisian Solar Plan (PST) 2010-2016	2009	Under preparation	Voluntary approaches, negotiated agreements (public-private sector), policy support, institutional creation, strategic planning, economic instruments, direct investment, infrastructure investments, voluntary approaches, unilateral commitments	Wind onshore, solar PV, solar thermal.
Decree 2009/362 on Renewable Energy and Energy Efficiency Premiums	2009	In force	Economic Instruments, Fiscal/financial incentives, Grants and subsidies	Multiple renewable energy sources including solar PV, solar thermal

Source: IEA and IRENA (2014)

[51] *According to PMR (2014a) prices were subsidized by 70% in 2012.*

[52] *See for instance: http://economie.jeuneafrique.com/entreprises/entreprises/energie/22507-la-tunisie-baisse-ses-subventions-au-secteur-energetique.html*

does not allow for the voluntary generation of renewable energy from private producers[53], the development of a new regulatory framework was kick-started in early 2012 in order to allow private electricity generation from renewable energy (Belet Cessac, 2014 and PMR, 2014). The most comprehensive example of RET promotion policies in Tunisia is the "Plan Solaire", a Public-Private Partnership for promoting renewable energy production through a set of 40 individual activities and essentially the backbone of Tunisian renewable energy policy.[54] The Plan Solaire focusses on wind and solar technologies as well as energy efficiency. "PROSOL ELEC", a programme to develop electricity production from solar PV, or "PROSOL", aimed at promoting solar thermal water heating, are two initiatives under the Plan. Financing for the Plan Solaire stems from the "Fonds National de Maîtrise de l´Énergie" (FNME), the STEG, private funding and international cooperation funds. Table 8 lists the most recent Tunisian policies and measures that support RET.

Financing options for renewable energy projects

As illustrated in Chapter 4, financing for RET can take various forms. For the Tunisian context, international and domestic financing sources are summarised below, concluding with the CDM.

International funding sources

Numerous bilateral and multilateral credit lines from partner governments and organisations have been provided over the past decade to foster RET deployment in Tunisia (ANME 2014). Amongst these institutions are, inter alia, the GIZ[55], the World Bank[56], UNEP, UNDP, the European Bank for Reconstruction and Development (EBRD) or the European Investment Bank (EIB)[57], the GEF or several European governments. Many of these international donors have started to play active roles in supporting NAMA activities and thus may be interested in providing partial-funding (*e.g.,* grants or loans) for the development of renewable energy and energy efficiency projects under a NAMA framework. A specific international source of finance that indirectly relates to the subject of energy supply is a loan provided by the International Monetary Fund (IMF) in 2013, which was provided to the Tunisian government for decreasing the state deficit under the condition that Tunisia abolish its fuel subsidies (IMF 2013).

National funding sources

In conjunction with international finance, domestic support has been harnessed in the energy sector as well. The most important national funding instrument in this respect, and for the field of RET, is the FNME.[60] This national fund for energy management is managed by the Ministry of Industry, Energy and Mining, and provides financial support for conventional energy, RET and energy efficiency projects. Currently the various financial incentives are available for renewable energy projects (Table 9).

The FNME fund is partially financed by a tax levy on the initial registration of cars in Tunisia, as well as on air conditioners and incandescent lamps (PEEI, 2014) and collects approx. DT 21 million per year.

For incentivising the deployment of RET, specific tax reductions exist, such as:

- Reduced custom duties (10% instead of 18%) and suspension of VAT for imported equipment used in energy conservation or renewable energy, for which no similar equipment is manufactured locally;
- Reduced custom duties and exemption from VAT for imported materials used in the field of energy conservation or renewable energy;

Table 9: FNME Incentives for RET in Tunisia

TECHNOLOGY	COVERAGE OF INVESTMENT COST	MAXIMUM*
Renewable energy(solar heating)	30%	DT 150 / m² of collector
Renewable energy (Biogas)	40%	DT 20,000
Renewable energy (biogas with power)	20%	DT 100,000

*Source: PEEI (2014); * DT= Tunisian Dinars (1 DT = approx. 0.55 USD in September 2014)*

53 *Though, no renewable energy auto-producers exist except for production of electricity by PV systems in buildings (solar roofs programme).*

54 *See http://www.anme.nat.tn/index.php?id=94*

55 *Up to 30% of the annual self supply through renewable energy may be sold to STEG on pre-defined proces , while producers need to pay for connection to the grid.*

56 *Out of these 40 projects, 5 are publicly-led, 29 privately, 5 support the National Solar Plan implementation and one comprises the creation of a new institution, namely the STEG Renewable Energy (IEA 2014c).*

57 *http://www.giz.de/expertise/downloads/giz2012-en-employment-renewable-energy-tunisia.pdf*

58 *http://www.worldbank.org/en/results/2013/05/23/energy-efficiency-in-tunisia-promoting-industry-while-protecting-the-environment*

59 *In early 2014 EIB provided a 150 million Euro loan for clean energy investment (http://europa.eu/rapid/press-release_BEI-14-47_en.htm)*

60 *As per decree No. 2005-2234 of 22 August 2005.*

» Suspension of VAT for local equipment and material used in the field of energy conservation or renewable energy.[61]

Thus, domestic opportunities to finance RET deployment programmes or strategies do exist. A NAMA can be built around such existing domestic funds and qualify as a domestically supported NAMA.

Clean Development Mechanism

To date, Tunisia is host to 9 active CDM activities (8 projects, 1 PoA), which are illustrated in Table 10. Amongst these, three projects and one PoA support RET deployment.

Given the current situation of the carbon market with its low credit prices and EU import restrictions for credits generated from projects not hosted by Least Developed Countries, the demand for new project credits in Tunisia will be limited and the CDM is unlikely to be a main financing option from 2015 onwards. However, the technical knowledge and understanding of mitigation activities gathered by the private and public sector through concrete project experiences and

Table 10: Registered Tunisian renewable energy CDM activities

	TITLE	STATUS	TYPE	EXPECTED ACCUMULATED 2020 KTCO$_2$E	TOTAL ISSUANCE (KCERS)	CREDIT BUYER	INVESTMENT M US$
COM projects	Djebel Chekir Landfill Gas Recovery and Flaring Project – Tunisia	Registered	Landfill gas	3697	185	Italy (Cementerie Aldo Barbetti, Endesa, ENEL, ERG, Italcementi, Iride Mercato, Italian Ministry of Environment)	4.6
	Landfill Gas Recovery and Flaring for 9 bundled landfills in Tunisia	Registered	Landfill gas	3179	28	Italy (Italian Carbon Fund)	6.7
	Bizerte Wind Farm Project	Registered	Wind	2922		France (Orbeo+CDC Climat)	231
	LRT System in Tunis	Registered	Transport	175		n.a.	651.4
	Tunisia: Sidi Daoud Wind Farm Project	Registered	Wind	473		Spain (IBRD)	44.7
	Partial substitution of fossil fuels with biomass at "Les Ciments Artificiels Tunisiens" cement plant, Tunis.	Registered	Biomass energy	465		Italy (Colacem+ Consul-System)	4.7
	Rural electrification and water supply by solar photovoltaic (PV) project in Tunisia	At Validation	Solar	13		n.a.	
	Integrated fuel switching Project at Industrial Facilities in Gafsa region – Tunisia	At Validation	Fossil fuel switch	283		n.a.	
PoA	Solar Water Heater Programme in Tunisia	Registered	Solar	417.63		France (Orbeo)	
	Solar Water Heater Programme in Tunisia – CPA 1-8	Registered	Solar	42,980 - 72,420		France (Orbeo)	

(UNEP DTU, 2014a)

[61] *https://energypedia.info/wiki/Tunisia_Energy_Situation*

the capacity-development programmes executed in Tunisia over the last ten years[62] will serve as a stepping stone for future climate policy instruments, including NAMAs and market based approaches.

Challenges to renewable energy deployment

Despite the programmes introduced by the government, the corresponding national regulations and existing financial opportunities, RET deployment still faces significant barriers in Tunisia (PMR 2014), which can be summarised as follows:

Regulatory and institutional barriers:

- While renewable energy is mainly allowed for own consumption, IPPs have limited access to the grid;
- No independent regulatory body exists for the electricity sector;
- The still ongoing transformation processes after the political changes in recent years slowed down the reform process of energy regulation;
- There is a lack of coordination among key stakeholders. Institutions such as ANME and STEG have different priorities regarding energy policy. While ANME fosters RETs, STEG focusses on energy supply from conventional resources. The diverging motivations have the potential to stymie the design and implementation of policies for RET deployment.

Technical barriers:

- The grid has weak capacity to absorb load variations from renewable energy;
- No grid code for renewable energy integration exists.

Financial barriers:

- Subsidies to conventional electricity still prevail, reducing the competitiveness of RETs – although the government has recently taken action to mitigate this barrier;
- High investment costs for RET prevent many developers from action;
- Measures/instruments to support renewables, such as an attractive FIT are not in place.

Tunisia and NAMAs

Tunisia communicated a comprehensive list of potential activities as NAMAs to the UNFCCC (UNFCCC 2013b), which included numerous renewable energy related activities. However, with regards to development of concrete NAMA concepts, Tunisia is still in an early stage of the process. So far, Tunisia has begun the development of three concrete NAMAs (Table 11), according to the NAMA database (2014). One of these is the "Plan Solaire Tunisia NAMA" that is based on the "Plan Solaire" introduced in 2009 and comprises 40 individual projects to promote wind and solar energy,

Table 11: Tunisian NAMA pipeline

	STAGE	SECTOR	SUB-SECTOR	OBJECTIVE	REQUIRED SUPPORT
Plan Solaire Tunisia NAMA	Under development	Energy supply	solar energy, wind energy, biomass and energy efficiency	Implementation of 40 individual projects to promote wind and solar energy, biogas and the introduction of energy efficiency measures in the transport and building sector	USD 480 million
NAMA on waste management	Under development	Waste		Significant reduction of methane emissions from biodegradable waste (agricultural waste, waste products from food production and sewage sludge)	No data
Energy conservation in the building sector	Under development	Buildings		The proposed NAMA for energy conservation (energy efficiency and renewable energy) in the building sector in Tunisia aims to reduce the demand for fossil fuel based energy in buildings, in particular that used for heating and cooling of buildings.	No data

Source: NAMA Database (2014)

[62] *For instance under the German CDM Initiative www.jiko-bmub.de/english/background_information/german_government_initiatives/doc/948.php*

biogas and the introduction of energy efficiency measures in the transport and building sector (see below). To date, there is no disclosed information whether and how much support has been secured for the NAMAs.

The Tunisian Solar Plan – a case for renewable energy NAMA?

The Plan Solaire – if implemented – would result in significant GHG mitigation benefits. It can thus benefit from being labelled as a NAMA as this would allow Tunisia to i) transparently showcase and quantify domestic mitigation action under the UNFCCC, and ii) attract climate finance funds for supporting the implementation of the activities under the plan (Text Box 7).

Over the last 5 years, numerous domestic and international actors were involved in debating and designing a NAMA under the Plan Solaire. An early NAMA concept for the Plan Solaire was already debated in 2010 (Ministère de l'Environnement et du Développement Durable, 2010). It was concluded that the Plan should be considered as one overarching NAMA including all projects, instead of each project becoming an individual NAMA. Arguments for the "one NAMA" approach included the simpler administration of the NAMA, high political support and high visibility due to the prominence of the Plan Solaire, a positive sustainable development impact arising from the heterogeneity of activities, and a more efficient MRV approach.

A detailed financial breakdown exists for most activities under the Plan Solaire. Overall, the costs for the individual activities total USD 2.4 billion to be invested for the implementation of all relative activities between 2010 and 2016. In 2010, almost 79% of the 40 projects under the Plan Solaire had partially secured finance through domestic sources, allowing these projects to form the domestically supported set of activities under the NAMA. For the remaining projects, international finance constitutes an option that could be harnessed under an internationally supported NAMA.[63]

The NAMA development process, as well as the further development and initial implementation of the Plan Solaire, stalled due to different institutional views on how to proceed with RET deployment. While ANME was, and is, clearly trying to foster RET, other institutions such as the STEG have an inclination to guarantee energy security through conventional energy sources. In addition, the political changes in Tunisia and the Arab region have led to drastic reforms of the policy making process.

However, despite an early start and detailed efforts, no breakthrough has been achieved with respect to putting

Box 7

SPELLING OUT A PLAN SOLAIRE NAMA

In 2013, the UNDP convened a study on the development of a NAMA in the context of the Plan Solaire.[64] In order to achieve significant GHG emission reductions, the study recommended focusing the NAMA elements solely on the promotion of large-scale renewable energy, with special emphasis on:

- Wind power for electricity generation;
- Solar PV connected to the grid; and
- CSP for electricity generation.

It was furthermore suggested to distinguish between central and decentralised power generation when developing the regulatory, institutional, technical, and financial framework under the NAMA. The centralised generation component of the NAMA could potentially contribute to an installed capacity of approximately 3,140 MW in Tunisia by 2030. For decentralised installations, the NAMA may contribute to increasing the number of net metering PV installations, reaching installed capacities of 60, 190 and 590 MW in the years 2016, 2020 and 2030, respectively. Regarding the estimated GHG mitigation benefits, the study calculated an abatement potential of 27 million tCO_2e between 2014 and 2030. Other positive impacts of the NAMA would be of an economic, environmental or social nature. Opportunities for designing a suitable MRV system were sketched as well. The costs for such a NAMA design were calculated at USD 6.1 million, including capital expenditures and administration.

[63] *In 2010, international donors had agreed to fund an amount of USD 11.5 million.*

[64] *The authors were involved in the UNDP NAMA study in 2013, which so far is not published.*

forward the Plan Solaire NAMA. This failure has various reasons, of which the most obvious is the significant change of the political landscape in Tunisia over the last 5 years. Another is the lack of clarity about the specific policy instruments to be developed and implemented under the NAMA. Initially, the Plan Solaire consisted solely of a list of 40 renewable energy projects without any underlying policy instruments (ANME and STEG 2009). Ministère de l'Environnement et du Développement Durable (2010) stated that USD 480 million were required as international support for the Plan Solaire NAMA, again without specifying any policy instruments. This omission is surprising given the positive experiences with the solar water heater subsidy programme PROSOL (Trabacchi et al., 2012). PROSOL demonstrated that clear management structures and attractive incentive schemes are core success elements for RET deployment. It remains puzzling why these successes have not been exploited to a larger extent in the design of the renewable energy NAMA in Tunisia. By 2013, the list of 40 projects had finally given way to a more aggregated approach; however, the nature of desired policy instruments still remains unclear. Only recently, ANME has proposed the following policies (PMR 2014):

- Reform of the legal framework for allowing grid-access of private renewable energy producers (process started);
- Introduction of attractive feed-in-tariffs for renewable energy (process started);
- Establishment of an independent regulator for the electricity sector (process started);
- Technical improvement of the grid for allowing the absorption of varying renewable energy loads;
- Creating a grid code for renewable energy integration (process started);
- Design of an MRV and management unit for the Plan Solaire.

With a few exceptions, the Plan Solaire remains at a conceptual stage, primarily due to the political situation and its implications on Tunisia's economy over the past 5 years. NAMAs have been adopted in Tunisia and their uptake has been primarily driven by the middle management in government institutions attached to ministries, such as ANME. The key challenge is that high government levels are rarely actively involved in the formulation of the NAMA. This challenge could be mitigated by increasing the communication between ministries and institutions. The development of the Plan Solaire as a NAMA under the current conditions will require time and potentially needs a strong push from external partners (*e.g.,* via support, or via conditional loans such as in the IMF case).

Lessons learned for overcoming challenges for renewable energy deployment in Tunisia

The case of the Tunisian Plan Solaire demonstrates key challenges in the planning and introduction of large-scale policy renewable energy programmes with a transformative character in developing countries, in particular for the energy sector. Due to the political crisis and its impact on institutional capacities and a traditionally strong focus on securing energy supply through conventional sources, the deployment of RET under the Plan Solaire has not gained momentum for years—although according to ANME a large share of the required finance has already been secured. Successful programmes such as PROSOL have, on the other hand, demonstrated that clear management structures and attractive incentive schemes are core success elements for RET deployment. It remains unclear why these successes have not been exploited to a larger extent in the design of the renewable energy NAMA in Tunisia.

NAMAs can help overcome barriers and challenges – for instance through the development of coordinating entities that mobilise a comprehensive stakeholder dialogue that could also facilitate the communication with high level politicians, or MRV protocols that provide transparency regarding mitigation successes and thus incentivise policies with high performance. However, NAMAs require reliable governance structures and full backing from high government levels for successful implementation. The main lesson from the Tunisian case is that a NAMA needs to become sufficiently attractive to high level government actors to overcome opposition from powerful interest groups. Otherwise, it risks being limited to feasibility studies promoted by agencies that are too weak to thwart that opposition.

6.2 CASE STUDY: CHILE

SUMMARY

With its favourable geography, Chile is well positioned for large-scale RET deployment in its national energy supply. While large hydropower plays an important role, non-conventional renewable energy (NCRE)[65] still has a minor share in the energy (and electricity) supply. Over the past decade, regulation favouring NCRE has been passed, as a result of which, the amount of installations under construction or in the planning stage is increasing. The new government has published an Energy Agenda in May 2014, which provides specific plans for reforming the energy regulation over the next years, and spells out targets for the increased use of NCRE. However, despite the government's support for RET in Chile, numerous financial, technical, and regulatory barriers exist—particularly for smaller installations and self-supply renewable energy (SSRE).

The Chilean SSRE NAMA offers an opportunity to overcome such barriers by providing a broad set of financial and technical incentives for SSRE deployment in Chile with the option of receiving national and international support. The NAMA creates a flexible framework that can be expanded both in time and scope. It shows that an existing and planned set of national policies or programmes can be integrated under the roof of a NAMA, which can serve not only as a coordinating framework for new and existing action, but also achieve GHG emission reductions.

Energy Profile: Chile

Current situation

As a result of its geographic characteristics, Chile has four separate national grids: a northern grid serving mainly mining companies and industry, a central grid accounting for approximately 75% of electricity use, and two southern grids which provide power to smaller populations. Given Chile's water resources, hydropower has historically played an important role for the country's energy supply, accounting for approximately 35% of the installed capacity (CNE, 2011 and 2014). The Chilean government continues to focus on hydropower for power generation, though, growing energy demands over the past 20 years coupled with the unpredictability of large-scale hydropower supply in drier seasons has prompted the government to increase its share of thermal power generation, mainly through natural gas.

Chile has a high potential for renewable energy generation, particularly from hydro and wind, but also from solar (IRENA, 2014c). While significant efforts and achievements in promoting renewable energy have been undertaken in Chile over the past decade, NCRE still represents only a minor share in the country´s energy supply as illustrated in Figure 12.

By December 2013, the installed capacity in Chile reached 17.74 GW, of which 60 % stems from fossil fuel based sources, approximately 34% from large-scale hydro, and 6% from NCRE. The latter breaks down into 332 MW of biomass/biogas, 335 MW of wind, 444 MW of mini-hydro, and 6.7 MW of PV (CNE, 2014 and CER, 2014a).

In 2013, 68.1 TWh of electricity were produced in Chile, of which NCRE constituted 5.8%, comprised of 3% biomass/gas, 2% mini-hydro, 0.8% wind and less than 0.01% PV. Conventional energy sources accounted for the remainder (including large-scale hydro with 21%) (CNE, 2014).

The electrification rate is close to 100%, with some exceptions in very remote regions in southern Chile (REN21, 2014c). Electricity prices in Chile have increased significantly (75% between 2006 and 2012 in the central grid) due to underperformance of large hydropower and growing energy needs. As Chile has very limited fossil fuel resources, the high energy prices provide a good incentive for further deployment of renewable energy. In particular, self-supply renewable energy (SSRE) systems have gained momentum in recent years (CER, 2013a).[66]

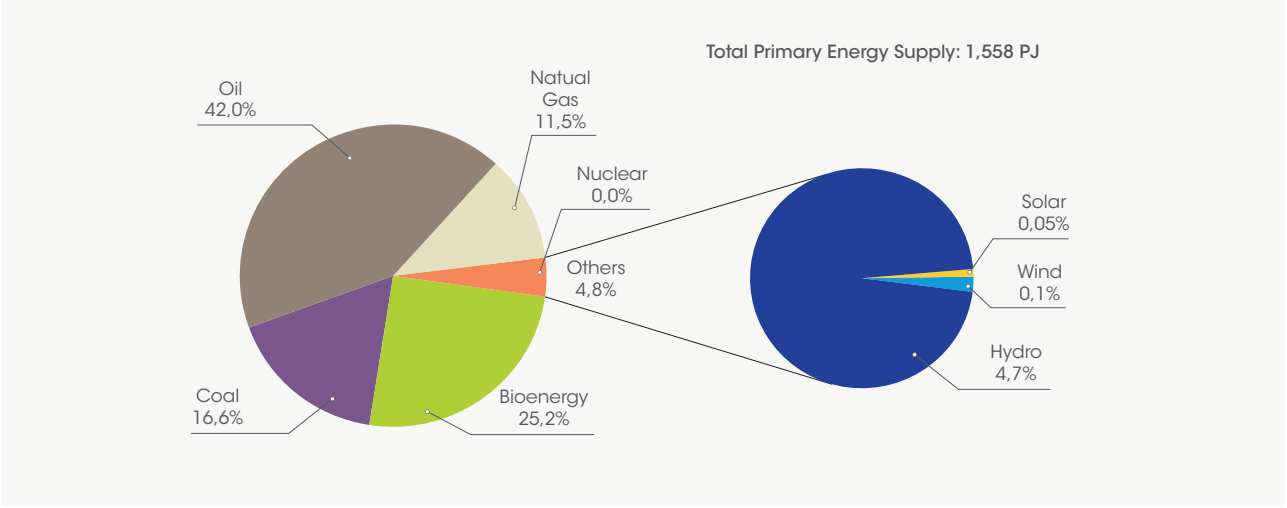
The vast majority of GHG emissions stem from the energy sector (75% by 2009 data), while agriculture accounts for 15%, followed by bunker fuels (4%), industrial processes (3%), and waste (3%) (CAIT, 2013)[67]

[65] *As per GIZ (2009), NCRE is classified as energy generated from biomass as a primary energy source, hydraulic energy less than 20 MW installed capacity, as well as energy generated from geothermal, solar, wind or tidal installations.*

[66] *SSRE are defined as installations that consume more than 50% of electricity generated on-site, and may feed the remainder to the grid (CER, 2013a).*

[67] *Excluding Land use, land use change and forestry.*

Figure 12: Shares of Chile's total primary energy supply in 2012



Source: IEA (2014c)

Future energy profile

The growing national energy demand has encouraged Chile to actively embark on renewable energy deployment. The Chilean government has mandated that companies that trade electricity in one of the two major grids must ensure a 5% share of NCRE by 2014 and a 10% share by 2024 (CER, 2012). Furthermore, the overall contribution from NCRE shall reach 25% by 2025 (Ministerio de Energía Chile, 2014). In September 2014, the installed capacity of NCRE had reached 1.78 GW. The main areas of growth are expected in wind and solar energy, where currently 0.8 GW are under construction (0.2 wind, 0.5 solar PV, 0.1 solar CSP) and almost 13 GW have passed environmental clearance processes (5.2 GW wind, 7 GW solar PV and 0.75 GW solar CSP) (CER, 2014b).

Institutional framework: Energy

The most relevant actors in Chilean energy policy are:

- The Ministry of Energy,
- The Chilean government's Economic Development Agency (CORFO),
- The Renewable Energy Centre (CER) Chile, as part of CORFO and implementing agency of the Energy Ministry. The CER is responsible for promoting and facilitating conditions for establishing NCRE in Chile, and
- The National Energy Commission (CNE), who is responsible for electricity policy under the Ministry of Economy.

Electricity sector reforms in the early 1980s led to the liberalisation of the market, resulting in generation, transmission and distribution being 100% owned by private companies. Based on the Energy Agenda of the Chilean government (Ministerio de Energía Chile, 2014) the competencies in the energy sector may be improved over the next years, with the Ministry of Energy aiming at increasing the geographical scope of its activities through a modernised institutional set up, and capacity building measures for energy related actors such as the CNE.

Institutional framework: Climate Change

The Chilean government is taking concrete steps to address the issue of climate change. In 2009, it established an Inter-Ministerial Committee on Climate Change consisting of the Presidential General Secretary and the Ministries of Foreign Affairs, Finance, Economy, Public Works, Agriculture, Mining, and Transportation and Telecommunications, as well as the Ministries for Energy and the Environment. The latter two are the most active, each possessing dedicated units for climate change issues. For instance, the Ministry of the Environment is the DNA for the CDM, while the Ministry of Energy coordinates the steering committee for mitigation action under the World Bank´s PMR.

Governmental RET Regulation and Policy

The Chilean energy policy promotes the availability of energy at competitive prices, a secure and long-term energy supply for the country, and environmentally sustainable forms of energy (CER, 2012). NCRE plays an important role in this context and is poised to become an important pillar of the country's energy supply over the next decades (Gobierno de Chile, 2012). Table 12 provides an overview of policies and measures for RET in Chile. Important adjustments to the General Law on Electricity that encourage RET are:

- Law 20.257 ("NCRE Law") that sets targets for corporate trade of electricity (NCRE percentage of 5% by 2014 and 10% by 2024) and contribution of electricity from NCRE of 20% by 2025;
- Law 19.940 ("Short Law I") that sets competitive advantages for small-scale renewable energy plants (< 20 MW) by waiving transmission fees and allowing for grid connection of plants < 9 MW (CER 2012).

Net metering allows electricity from installations of up to 100 KW to be fed into the grid. According to the National Energy Strategy 2012 – 2030 (Gobierno de Chile, 2012), open tendering procedures for NCRE are planned. Most recently, in May 2014, Chile initiated a tax reform that includes environmental taxes such as an annual tax on GHG emissions from thermal power plants (> 50 MW installed capacity). The carbon tax will require the payment of USD 5 per tCO_2e emitted and shall enter into force in 2017. It will thus provide a further incentive for investment into RET (Borregaard, 2014). The new government has furthermore defined an Energy Agenda in May 2014 (Ministerio de

Table 12: RET Support Policies & Measures in Chile

TITLE	YEAR	POLICY STATUS	POLICY TYPE	POLICY TARGET
Access Energy Found (pilot)	2014 (Jan 1st)	In force	Economic instruments, direct investment, infrastructure investments, information and education, advice/aid in implementation, research, development and deployment (RD&D), Demonstration project	Multiple RE Sources, All
Electrical Easement Act (N° 29,701)	2013	In force	Regulatory Instruments	Multiple RE Sources, Power
National Strategy for the Energy Sector	2012 (February 28th)	In force	Policy Support, Strategic planning	Multiple RE Sources
Support for Non-Conventional Renewable Energy Development Programme	2012	In force	Economic Instruments, Direct investment, Infrastructure investments, RD&D funding	Bioenergy, Geothermal, Hydropower, Multiple RE Sources, Ocean, Solar, Solar Thermal, Wind
Regulatory Framework for Solar Water Thermal (Law 20,365)	2009	In force	Regulatory Instruments, Codes and standards, Economic Instruments, Fiscal/ financial incentives	Solar Thermal, Solar heat
Program for Rural and Social Energy (PERYS)	2009	In force	Policy Support, Economic Instruments, Regulatory Instruments	Multiple RE Sources, Bioenergy, Wind, Solar, Solar photovoltaic, Solar Thermal, Solar heat
Non-conventional renewable energy law (Law 20.257)	2008 (April 1st)	In force	Regulatory Instruments, Obligation schemes	Bioenergy, Biomass for power, Geothermal, Multiple RE Sources, Ocean, Solar Thermal, Wind, Bioenergy, Hydropower
Invest Chile Project	2005	In force	Economic Instruments, Direct investment, RD&D funding	Wind, Bioenergy, Biomass for power, Geothermal, Power, Hydropower, Multiple RE Sources, Power
Access for Small and Non-Conventional Power Producers: Short Law I and II	2005	In force	Regulatory Instruments	Multiple RE Sources, Power, Multiple RE Sources

Source: IEA & IRENA (2014)

Energía Chile, 2014) that sketches the governments ideas for a reformed energy policy from 2015 onwards and aims to revise existing regulation.

Financing options for renewable energy projects

As illustrated in Chapter 4, financing for RET can take various forms. For the Chilean context, international and domestic financing sources are summarised below, concluding with the CDM.

International Funding Sources

International donors are involved in numerous RET related activities in Chile, such as:

- **The Clean Technology Fund** for co-financing the Renewable Energy Self Supply Energy Efficiency programme[68],
- Prefeasibility Studies financed by **German KfW bank,**
- **CER / CORFO biogas projects (financed through GEF):** The government will support pre-investment studies and training at small- and medium-sized firms in southern Chile with the objective to reduce wastes and contamination and produce energy for industrial processes.

National Funding Sources

Numerous national vehicles for funding RET exist in Chile, of which the most important are:

- **InnovaCorfo Renewable Energy Innovation Fund:** USD 10 million fund for financing up to 50% of SSRE projects (USD 1 million cap per project),
- **CER support for pre-feasibility studies:** Funding of up to 40% of costs for pre-feasibility studies for RET projects in northern or central Chile. Coordinated by CER with support from German KfW Bank[69];
- **RET for Irrigation support:** Funds that support SSRE investment for irrigation-related projects. In 2012 and 2013 two funding rounds were held. Coordinated by the National Commission for Irrigation (CNR) under the Ministry of Agriculture, with support of the Ministry of Energy.
- **Renewable energy for agriculture activities:** Funds that support SSRE investment in agro projects, coordinated by the Agrarian Innovation Fund (FIA) under the Ministry of Agriculture, with support from the Ministry of Energy.

In addition to the above sources, the government triggered private investment into NCRE through CORFO instruments for financing and investment, business development, and entrepreneurship and innovation (CER 2012).

Clean Development Mechanism

Chile has been an active host of CDM projects and programmes, with a total of 101 registered projects and 21 under validation, and 9 registered PoAs and 5 under validation (UNEP and DTU, 2014). Renewable energy accounts for approx. 60% of registered CDM projects and 100% of registered PoAs, as seen in the renewable energy relevant projects extracted from the CDM Pipeline illustrated in Table 13.

The downturn in carbon markets has shifted attention away from CDM project development and instead towards the direction of NAMAs and other supporting mechanisms. The experiences gained under the CDM can however serve as a stepping stone for future climate policy instruments such as NAMAs and other future market based instruments.

Challenges to renewable energy deployment

The barriers for deployment of large hydro versus NCRE are distinct. For large hydro projects, securing finance is a challenging task. Forecasting dry seasons is highly difficult, limiting the predictability of load factors – an issue that has led the government to further diversify the energy mix. Also, environmental concerns associated with large hydro projects are raised by NGOs and local stakeholders and represent a serious barrier for many projects. For NCRE the following challenges apply (CER 2013a):

- Financial barriers:
  - High incremental costs of RET compared to conventional energy investments, *i.e.,* longer payback periods and lower return rates;

[68] *https://www.climateinvestmentfunds.org/cifnet/investment-plan/chiles-ctf-investment-plan*

[69] *In September 2014, a third tranche provided finance for pre-feasibility studies of 15 small hydro, 15 wind energy, 12 solar power, seven biomass energy and one hybrid project.*

- Limited access to private sector loans, as transaction costs of small scale RET projects often appear prohibitive by banks;
- Uncertain outcomes of pre-feasibility studies hinder investment in such research.

» Capacity barriers:

- Lack of technical personnel for planning, installation, operation and maintenance of RET;

» Awareness:

- Lack of understanding for the potential of RET, and SSRE in particular, and limited access to project sites for visits.

However, the high energy costs as well as the black outs in dry seasons have become strong drivers for RET deployment and have, for instance, led major corporate organisations to consider SSRE as a viable option for their energy supply (CER 2013b).

Chile and NAMAs

Chile has recognised the opportunities offered by NAMAs and is an active country in NAMA development. It has already communicated a comprehensive list of potential NAMA activities to the UNFCCC (UNFCCC 2013b). To date, Chile has started to develop 11 concrete NAMAs (Table 14). However, of these, only the "Self Supply Renewable Energy NAMA" is beginning implementation with the remaining ten still in the conceptual phase – see below for a more detailed description of the "Self Supply Renewable Energy NAMA".

The Chilean SSRE NAMA– a case for renewable energy NAMA?

Objective

Chile has begun the development of a NAMA to support the increased deployment of SSRE projects throughout Chile, thereby reducing GHG emissions and promoting the development of the national renewable energy industry. Self-supply renewable energy under this NAMA is defined as installations that consume more than 50% of their electricity generation, while the remainder may be fed into the grid (CER 2013a)[70].

While SSRE activities would benefit most industrial and commercial sectors in Chile, the NAMA concept has initially identified three subsectors with the largest potential for SSRE application: the agro industry (livestock, dairy, fruit and wine), retail (supermarkets and shopping centres), and tourism (hotels). Public sector activities (such as hospitals, schools, universities and large government owned buildings) are foreseen for inclusion at a later stage of the NAMA (CER 2013a,b). A detailed concept put forward in 2013 expects the NAMA to be operational for at least 6 years to allow sufficient time for the programme to achieve sustainable impacts.

Table 13: Registered Chilean renewable energy CDM activities

NO. OF REGISTERED ACTIVITIES		TYPE	EXPECTED ACCUMULATED 2020 KTCO$_2$E	TOTAL ISSUANCE (KCERS)	INVESTMENT M USD
CDM projects	1	Geothermal	2,253		320.30
	32	Hydro	24,018	2790	1,796.20
	19	Wind	20,824	261	3,145.80
	7	Solar	4,440		954
PoA	2	Hydro	105,665		
	2	Wind	401,727		
	5	Solar	3,146,009		

Source: UNEP and DTU (2014a)

[70] *The most relevant technologies include PV panels, solar water heaters, waste-to-energy biogas, waste-to-energy biomass, mini-hydro, geothermal heat pumps and small-scale wind. Public utility projects are excluded.*

Table 14: Chilean NAMA pipeline

	STAGE	SECTOR NAME	SUB-SECTOR	OBJECTIVE	REQUIRED SUPPORT
Expanding self-supply renewable energy systems in Chile	Implementation	Energy supply	Renewable energy (unspecified)	The objective of the NAMA is to reduce emissions by fostering self-supply renewable energy projects and contribute to the long-term development of the renewable energy industry in Chile. The NAMA will achieve the objectives through a comprehensive programme of measures to remove barriers and incentivise SSRE investments with three components: a financial component, a technical support component and an outreach component.	USD 15.5 million
Santiago Transportation Green Zone	Under development	Transport		Low emission vehicles (taxis and Transantiago), bicycle promotion, transit management	USD 17.3 million
Organic Waste NAMA	Under development	Waste		Re-use of organic waste	
Forestry NAMA	Under development	Forestry		This NAMA aims to advance the implementation of the country's Platform for the Generation and Trading of Forest Carbon Credits (PBCCh).	USD 7.75 million
National Program for Catalyzing Industrial and Commercial Organic Waste Management in Chile	Under development	Waste		The objective of this NAMA is to catalyse the installation of the first facilities for industrial and commercial organic waste management in Chile (it does not include household organic waste).	USD 30 million
Price stabilisation fund for renewable energy	Under development	Energy supply	Renewable energy (unspecified)	Revolving fund to insure renewable energy projects against spot market price fluctuation	
Off-grid non-conventional renewable energy	Under development	Energy supply	Renewable energy (solar) Renewable energy (biomass) Renewable energy (geothermal)	Incentive program for off-grid implementation of non-conventional renewable energy in the industrial and commercial sectors	
E-mobility readiness plan	Under development	Transport		The E-mobility Readiness Plan is designed to promote the introduction of grid-enabled electric vehicles in Chile on a large scale, with a target of 70,000 electric vehicles by the year 2020. The plan foresees the implementation of a set of activities to remove barriers and provide incentives to achieve the overall target.	USD 6.65 million
Programme for energy efficiency in the transport sector in Chile	Under development	Transport		Promotion of energy efficiency in the transport sector to reduce GHG emissions and to secure sustainable cargo and passenger transport	
CSP NAMA	Under development	Energy supply	Renewable energy (solar)	The objective is to construct a single CSP plant in northern Chile with a capacity of approximately 50MW	

Source: NAMA Database (2014)

To achieve its objective, the NAMA applies a comprehensive set of measures to remove barriers and incentivise investments. Such measures are expected to include a financial component and a technical support component.

The financial component consists of a pre-investment grant for supporting feasibility studies of potential projects, a guarantee fund to facilitate access to loans, and investment grants of up to 20% of the total investment cost of an installation.

The financing component is currently under development. Initial ideas estimated the total amount for the financing component for up to USD 95.5 million. This figure consists of grants (USD 15.5 million) and loans (USD 80 million). The USD 15.5 million for grants could be split into USD 1 million for pre-investment, USD 3.5 million for investment grants, USD 10 million for credit guarantees for concessional loans in a guarantee fund, and USD 1 million for MRV and NAMA administration. The USD 15.5 grant share is defined as incremental costs (see also Chapter 4 above) that are required for unlocking sufficient private finance. The loan part could be comprised of USD 50 million for a concessional loan credit line from domestic or international development banks, as well as USD 30 million of input from private sector banks for capitalising the loan programme.

The NAMA is expected to leverage about USD 100 million of private finance, an amount sufficient for supporting approximately 112 electric power and 15 thermal activities. Responsible entities for the financing component are CORFO and the German KfW Bank (CER, 2013b,c).

The technical support component, which is also currently being elaborated, would consist of capacity building measures for stakeholders. USD 2.4 million are expected to be required for the first 5 years, broken down into a technical help desk (USD 0.75 million), virtual matchmaking platform (USD 0.6 million), technical courses (USD 0.25 million), a knowledge exchange programme for national and international experts (USD 0.3 million), as well as a support programme for connection to the national electricity grid (USD 0.5 million). The technical component aims to train 500 people and provides support for 1,000 projects through the help desk. 50 projects shall be supported in grid connection and all SSRE projects shall be integrated into an MRV platform that is currently being established. The responsible entity for implementing the technical component is GIZ.

Part of the technical component is an outreach and awareness raising strategy that consists of public awareness campaigns, technology road shows and demonstrations, and regional and local events, with a financial volume of USD 100.000 over the first 3 years. The NAMA developers aim to achieve at least 60 media appearances and public activities for awareness raising (NAMA Database, 2014 and CER, 2013c).

The two components of the NAMA are supported from both domestic and international sources. For example, on the domestic level, CER has already acquired USD 10 million for co-financing capital costs of SSRE projects and technical support action. Also, the NAMA complements other existing programmes such as the CTF Investment Plan for Chile (with a SSRE component), a GEF project to support agro industry biogas projects, and SSRE grants from the Ministry of Energy. International support can provide the financing of grants and loans as well as support the technical component. Chile has applied for funding at the NAMA Facility, which is currently reviewing the proposal. The NAMA proposal development has received finance from the International Climate Initiative of the German government and the establishment of a MRV platform is supported through the British and German governments.

From an institutional perspective, the NAMA is based on a proposal of the Chilean Ministry of Energy, while the coordination of the NAMA proposal process as well as NAMA implementation is led by Chile's Renewable Energy Centre (CER). CER was supported by Ecofys and Fundación Chile in developing the NAMA proposal.

GHG emission reductions of the NAMA are anticipated to be approx. 1.5 Mt CO_2e until 2023. According to the NAMA proposal, MRV of emission reductions through project proponents is a pre-condition for funding. Relevant data need to be metered or monitored and reported to the NAMA coordinator. In case installations do not perform according to predetermined standards, corrective action (without

sanctions) will be taken. Data verification will be conducted through audits of a sample of installations. In addition to GHG reduction, the NAMA is expected to achieve sustainable development impacts (co-benefits), such as job creation through NAMA-supported SSRE projects; reduction of environmental pollution, noise and noxious odours from project sites; reduced energy use and costs; and higher energy security at both a national and local level (CER, 2013b).

Lessons learned for overcoming challenges for renewable energy deployment in the Chilean NAMA

Through the SSRE NAMA, Chile is addressing barriers that have historically prevented SSRE from gaining further momentum. The grants and soft loans can help overcome financial barriers, while the detailed technical support component—with its help desk and direct assistance for project developers—and the strategic outreach activities further pave the way for SSRE in Chile. The NAMA is not an exclusive vehicle in this regard as Chilean institutions have already proposed related programmes supporting SSRE deployment; however, the NAMA creates a framework that can receive resources for support on a national and international level and can be expanded in time and scope.

However, it has also become clear that difficulties remain in access to information, as data at an aggregated level is not available, *e.g.,* to elaborate base lines. Also different timings for financial and technical components, not only during its development, but also at the implementation stage pose challenges to the NAMA developers. Overall, the case of the Chilean SSRE NAMA shows that an existing and planned set of national policies or programmes can be integrated under a NAMA, which can also serve not only as a coordinating framework for new and existing action, but also achieve GHG emission reductions.

6.3 CASE STUDY: MEXICO

SUMMARY

Mexico will face a substantial increase in energy demand over the next decade, requiring the country to restructure its energy sector and explore options for developing a larger share of RET. A recently introduced energy reform package is set to liberalise Mexico's power generation market and further encourage RET deployment. This shift indicates how the development of emerging economies can create requisite economic pressures to improve resource efficiency, in turn leading to increased utilisation of RET.

The energy sector reform package is currently addressing the most important economic, institutional and political barriers to RET deployment in Mexico. However, it remains to be seen how quickly the reforms will be implemented and their effectiveness in facilitating RET development.

NAMAs can thus play an important role in promoting RET in Mexico over the coming years. Already, Mexico is a frontrunner in NAMA development and has vast experiences with the implementation of NAMAs. The Mexican NAMA for Sustainable New Housing, which also has a PV component, provides an interesting example. This NAMA demonstrates the long timelines necessary to develop a NAMA from the conceptual to the implementation stage. As various stakeholders are involved in the process, a strong NAMA coordinator is crucial for keeping the objectives of the NAMA in line with the different needs and expectations of lobby groups and managing the implications of political developments.

Energy Profile: Mexico

Current Situation

The Mexican energy sector relies largely on conventional energy sources and accounts for about two thirds of Mexico´s total GHG emissions[71] (Sermanat, 2013). Despite a high potential for energy generation from wind, hydro, solar, biomass, and geothermal (IRENA, 2014d), renewable energy plays only a secondary role in the country´s energy supply, as illustrated in Figure 13. In terms

[71] *Including transport*

of electricity generation, renewable energy accounts for approximately 22% of the installed capacity, with large-scale hydropower representing the largest share at 18%, while wind at 2%, and small hydro and geothermal at 1% each. In 2013, 258 TWh of electricity were produced, with a 13.7% share from renewable energy, including 10.6% from hydro, 2.4% from geothermal, 0.7% from wind and only 0.005% from PV. Nuclear power accounted for 4.6%, with the remaining 81.7% supplied by fossil fuel based generation (SENER, 2014b). Electricity prices are subsidised below generation costs, particularly for the residential and agriculture sectors (ibid.). Industries currently receive little or no subsidy. The previously mentioned energy reforms aim to reduce the cost of production, hence reducing the total amount of subsidies. The electrification rate is 98%, with almost 100% in cities and 95% in rural areas (EIA, 2014b).

Future Energy Profile

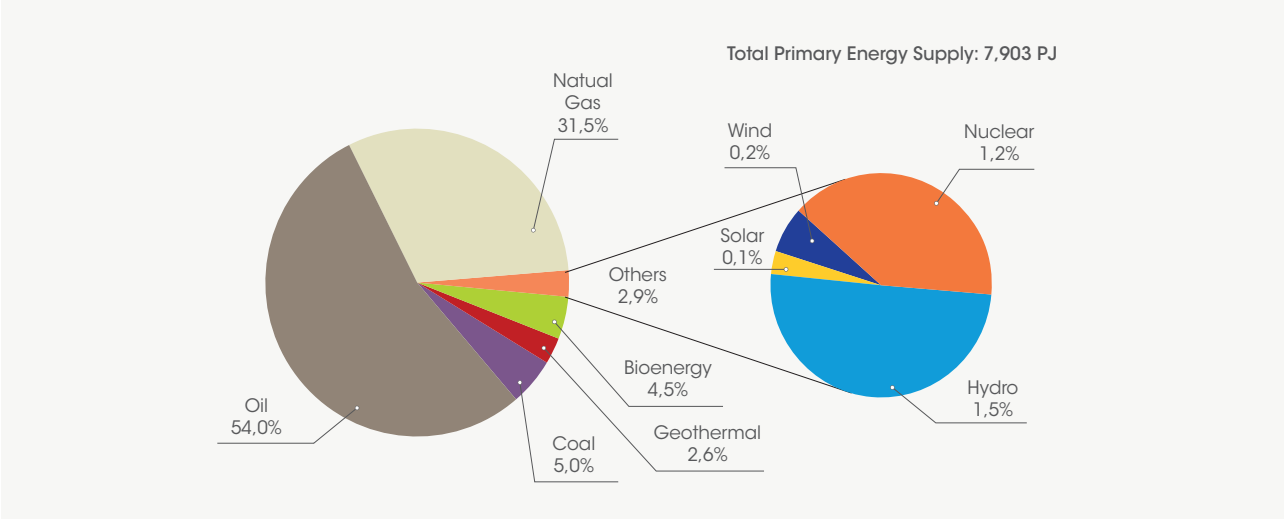
Mexico faces a growing energy demand that requires not only a massive capacity expansion but also contributes to its growing GHG emissions. Emissions stemming from the power sector are expected to grow by 50% by 2050. Mexico's Climate Change Law stipulated that the country should reduce emissions by 50% in 2050 compared to the 2000 emissions levels (Álvarez, 2013; Semarnat, 2012); specific measures for RET deployment have been put forward in line with this goal (Table 15). Based on its Special Program on renewable energy of April 2014 (Mexican Government, 2014) the country aims to achieve 25% electricity generation from renewable energy by 2018. The goal to achieve 4.34% of installed wind energy capacity and 1.65% of geothermal capacity by 2012 was not met, while the targeted 0.77% for small hydro has been exceeded (IRENA, 2014d). The Mexican energy sector reform laws introduced in the summer of 2014 set a target for a 35% renewable energy share in energy production by 2024.

According to the Secretaríat de Energía (SENER, 2014a), capacity expansion plans for 25 new hydropower plants in various planning stages—from pre-feasibility studies to open bidding procedures—will lead to the installation of an additional 7,718 MW (19,051 GWh) by 2016. The planned expansion of 5 existing hydropower plants will lead to an additional 778 MW of installed capacity (925 GWh). For wind power, the project pipeline consists of 5 additional sites totalling an additional 507 MW capacity (1,853 GWh), while 6 additional geothermal energy sites are expected to provide an additional 291 MW of capacity (2,018 GWh). For thermal power generation, 22 plants with additional capacity of 12,055 MW were planned until 2016. For 2016, SENER (2014a) projects an 11.5% share of renewable energy (hydro 8.6%, geothermal and wind 2.9%) in the state owned gross generation ("public service"), a slight decrease from 2013 levels.

Institutional Framework: Energy

The Mexican energy sector is governed by federal law, with electricity generation under federal control. In summer 2014, the Mexican president signed a major energy package to reform the energy sector; the

Figure 13: Shares of Mexico's total primary energy supply in 2012



Source: IEA (2014f)

respective secondary laws mainly address changes in concessions for oil and gas exploitation but also target the electricity sector. To date, the most relevant actors in the Mexican energy policy (with a focus on electricity generation) were:

- The Department of Energy (SENER), which is responsible for Mexican energy policy;
- The Federal Electricity Commission (Comisión Federal de Electricidad, CFE), which is responsible for federal control of electricity generation. It also holds a monopoly in transmission and distribution. Under the energy reforms, CFE´s organisation will be restructured and its monopoly power reduced in favour of private sector action;
- The Energy Regulatory Commission (Comisión Reguladora de Energía, CRE), which inter alia has regulated the electricity and gas sectors since 1995—however with no jurisdiction over CFE.

Prevalent market conditions in the Mexican power sector create disincentives for investment in RETs and make natural gas the technology of choice for expansion in power generation (Reegle 2014, statement of SENER). Private participation in electricity generation is permitted since 1992 (upon approval of CRE), including (1) self-supply and cogeneration, (2) independent power production and (3) independent small production (below 30 MW installed capacity), as well as import/export (EIA 2014b). Outputs from (2) and (3) need to be sold through CFE, making investment in RET generally less attractive for private actors. Under the energy reform laws, opportunities for private sector generation of electricity are likely improve. By mid-2014, permission for private generation was granted for 35.9 GW of installed capacity, which is already 67% of the total installed capacity in Mexico and thus is significant (CRE 2014).

Institutional Framework: Climate Change

Mexico demonstrates a solid institutional set-up regarding climate change mitigation action that provides a profound and experienced basis for future climate change policies and mitigation actions. The most important institutions and tools in this context are the National System for Climate Change (SINACC) and the Inter-ministerial Commission on Climate Change (CICC)—the bodies responsible for the development and implementation of mitigation and adaptation policies, coordination of climate aspects between different areas and governmental levels and the execution of climate change related activities.

On the government's Executive side, the Department of Energy (Secretaría de Energía – SENER) and the Department of Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales – SEMARNAT) are the key institutions for climate change related issues.

The overarching political instrument of Mexico's climate change policy is the General Law on Climate Change (Ley General de Cambio Climático). Its main objectives are to enhance and facilitate national climate change policy, to adopt long-term adaptation and mitigation actions and to define the obligations of the different authorities involved (SEMARNAT 2013). Amongst other requirements, the LGCC mandates the federal government to achieve these objectives through the elaboration and implementation of a National Climate Change Strategy (Estrategia Nacional de Cambio Climático) (ENCC). The ENCC has been established and guides the national climate change policy over the next 40 years. It aims to tackle the effects of climate change and move towards a competitive, sustainable and low emissions economy by determining the most appropriate strategic approaches and actions. This strategy is a result of the cooperation of citizens, enterprises, educational and academic institutions and the government and focusses mainly on cross-sector climate policy. The current administration´s Climate Change Programme (Programa Especial de Cambio Climático – PECC) brings low emission growth concepts – including NAMAs and current and future carbon markets – into focus through outlets such as the Emissions Trading Registry and the Climate Change Fund (PMR, 2013 and International Partnership on Mitigation and MRV, 2013).

Governmental RET Regulation and Policy

Mexico has put forward a set of regulations fostering RET deployment. The most relevant of these is the 2008 "Law for the Development of Renewable Energy and Energy Transition Financing" (LAERFTE) that regulates the use of renewable energy resources. The law spurred the development of a special programme for the use of renewable energy and a national energy strategy and laid the foundation for the RET fund (see below). Table 15 provides an overview of the existing renewable energy-related regulations.

Table 15: RET Support Policies & Measures in Mexico

TITLE	YEAR	POLICY STATUS	POLICY TYPE	POLICY TARGET
Large-scale renewable energy development project (PERGE)	2013 (May 1st)	In force	Economic instruments, direct investment	Multiple renewable energy sources
National renewable energy inventory	2013 (May 1st)	In force	Information and education, information provision	Multiple renewable energy sources
General Law of Climate Change (Ley General de Cambio Climático)	2012 (Oct 10th)	In force	Policy support, institutional creation	Multiple renewable energy sources
Fund for the Energy Transition and Sustainable Electricity Use	2009 (Sept 1st)	In force	Economic instruments; direct investment; research, development and deployment (RD&D); demonstration project; research programme	Multiple renewable energy sources
Special Programme for the Use of Renewable Energy 2014-2018	2014 (April 28th)	In force	Regulatory instruments, codes and standards, information and education, information provision, economic instruments, fiscal/financial incentives, tax relief, fiscal/ financial incentives, grants and subsidies	Multiple renewable energy sources
Methodology to value the externalities associated with the Electricity Generation in Mexico	2009	In force	Policy Support, Strategic planning	Multiple renewable energy sources
Law for the Development of Renewable Energy and Energy Transition Financing (LAFAERTE)	2008	In force	Regulatory instruments, other mandatory requirements, economic instruments, fiscal/ financial incentives, policy support, strategic planning, institutional creation	Wind, geothermal, solar, hydropower
Integrated Energy Services Project (2007-2014)	2008	In force	Economic instruments, direct investment, infrastructure investments, economic instruments, fiscal/financial incentives, grants and subsidies, policy support	Solar, solar, solar photovoltaic
Energy Sustainability Fund (Fondo de Sustentabilidad Energética)	2008	In force	Research, development and deployment (RD&D); research programme	Multiple renewable energy Sources
Accelerated Depreciation for Environmental Investment (Depreciación acelerada para inversiones que reportan beneficios ambientales)	2005	In force	Economic instruments, fiscal/ financial incentives, tax relief	Multiple renewable energy Sources
Wheeling Service Agreement for electricity from renewable energy sources (Convenio para el servicio de Transmisión de energía eléctrica para fuente de energía renovable)	2004	In force	Regulatory instruments	Multiple renewable energy Sources
Methodology to establish service charges for transmission of renewable electricity (Metodología para la determinación de los cargos por servicios de transmisión de energía eléctrica para fuente de energía renovable.	2003	In force	Regulatory instruments	Multiple renewable energy Sources
Grid interconnection contract for renewable energy (Contrato de interconexión para fuente de energía renovable)	2001	In force	Regulatory instruments	Multiple renewable energy sources, including solar wind, hydropower.

Source: IEA and IRENA (2014)

The energy reform process of 2014 marks an important step in Mexican energy policy and for renewable energy development in the country. The secondary laws with relevance for renewable energy include the following:

- Allow for the government to set clean energy mandates for CFE and other electricity suppliers;
- Establish clean energy tradable certificate schemes;
- Create an Independent System Operator to secure non-discriminatory access to interconnection;
- Set up new processes to facilitate the planning and investment in transmission that benefit RET;
- Set up a framework to enable investments in distributed generation.

Other policies that have been implemented comprise a set of mid and long-term goals and tax incentives for RET investment.

Financing Options for Renewable Energy Projects

RET already represents an important component of the Mexican power generation fleet. In light of Mexico's increasing energy demands and its recent sector specific reforms, it is clear that renewable energy will play an even more important role for electricity generation in Mexico in the future decade. Besides traditional private investment, financing options for renewable energy exist on the domestic as well as international level and are summarised below.

International Funding Sources

International donors such as the World Bank or IDB have been actively involved in supporting energy sector projects in Mexico. Many of these international donors have started to play active roles in supporting NAMA activities and thus may be interested in providing partial-funding (*e.g.,* grants or loans) for the development of renewable energy and energy efficiency projects under a NAMA framework.

In 2011, the World Bank issued USD 350,000 as a grant under the Partnership for Market Readiness (PMR) programme for Mexico's efforts in introducing new mitigation instruments. Mexico is very active in developing market-based NAMAs under the PMR.[72] Mexico has also benefited from large GEF funding.[73]

National Funding Sources

The renewable energy Law introduced a "Fund for the Energy Transition and the Sustainable Use of Energy", which will ensure the financing of energy-related projects evaluated and approved by the Technical Committee chaired by SENER. In 2014, the Fund allocated about USD 80 million for renewable energy and Energy Efficiency projects and programmes.

The national development banks, including Nacional Financiera S. N. C. (NAFINSA) and Banco de Comercio Exterior (Bancomex) have been relevant financiers of renewable energy projects in the country, providing liquidity and warranties. Mexico has also imposed a domestic tax on CO_2 emissions ("carbon tax") since 2014. The revenues from this tax, which reached a rate of USD 3.5/t CO_2 on all fossil fuels except natural gas, flow directly into the general budget.

Clean Development Mechanism

To date, Mexico is host to 201 registered CDM activities (191 projects, 10 PoAs), of which 39 address RET (illustrated in Table 16). Half of Mexico's 201 registered projects address "methane avoidance", with a particularly large share of animal waste projects. These are followed by wind (15%) and landfill gas projects (14%). Almost 30% of all Mexican registered projects have been issued CERs.

Given the current situation of the carbon market with its low credit prices and EU import restrictions on credits generated from projects located outside of Least Developed Countries, foreign demand for new project credits in Mexico will be limited. However, CERs can be used by entities to offset carbon tax liabilities which will mobilise demand up to the price level implied in the carbon tax. The technical knowledge and understanding of mitigation activities gathered by the private and public sector through concrete project experiences will serve as a stepping stone for future

[72] *In 2013, the PMR further granted USD 3 million to develop 3 crediting NAMAs*

[73] *For instance „Mexico Sustainable Energy Technology Development " (http://www.thegef.org/gef/project_detail?projID=5387), "Grid-connected Photovoltaic Project" (http://www.thegef.org/gef/project_detail?projID=3142), or "Integrated Energy Services for Small Localities of Rural Mexico" (http://www.thegef.org/gef/project_detail?projID=2611).*

Table 16: Registered Mexican renewable energy CDM activities

	NO. OF REGISTERED ACTIVITIES	TYPE	EXPECTED ACCUMULATED 2020 KTCO$_2$E	TOTAL ISSUANCE (KCERS)	INVESTMENT M USD
CDM projects	1	Geothermal	692	-	98.9
	7	Hydro	2,956	630	216.3
	29	Wind	70,505	2,904	8,189.40
PoA	1	Hydro	38,501	-	-
	1	Wind & Solar	133,612	-	-

Source: UNEP DTU CDM Pipeline (2014a)

climate policy instruments such as NAMAs and market based approaches.

Challenges to Renewable Energy Deployment

Challenges for renewable energy deployment in Mexico include the following aspects:

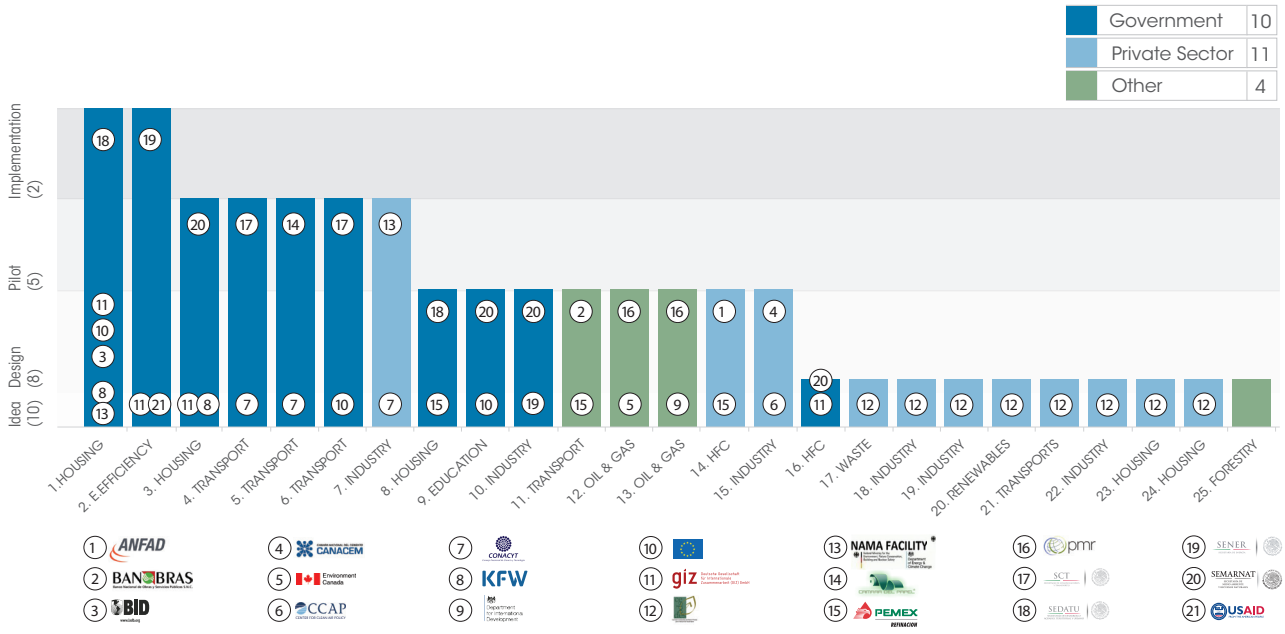
- Historical dominance of fossil fuel based technologies: The Mexican wealth of fossil fuel reserves leads to a strong focus of Mexican energy policy and energy sector lobby on oil and gas, reducing the role RET has been able to play. This focus may shift given the growing energy demands and recent energy reforms.

- Competitive disadvantages over fossil fuels: The requirements for public actors to buy electricity from the cheapest available sources favours fossil fuels and dis-incentivises RET deployment. This situation may change with the energy reform of 2014.

Mexico and NAMAs

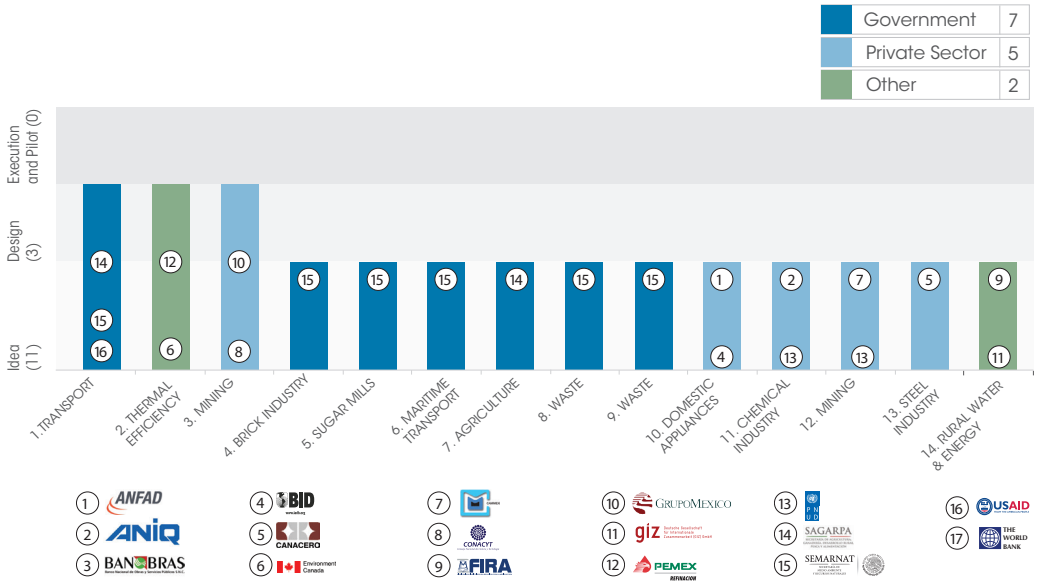
Mexico is a frontrunner in NAMA development and has already communicated a comprehensive list of potential activities as NAMAs to the UNFCCC (UNFCCC, 2013b). To date, the Mexican government has registered 25 NAMAs in different planning stages (Figure 14). One of these is the "NAMA for Sustainable New Housing", which is one of the most advanced NAMAs in the world in terms of technical maturity and institutional establishment thus providing a wealth of lessons learnt (see below). As illustrated in Figure 15, fifteen NAMAs are awaiting registration with the Mexican government.

Figure 14: NAMAs registered with the Mexican government



Source: SENER

Figure 15: NAMAs awaiting registration with the Mexican government



Source: SENER

The Mexican NAMA for Sustainable New Housing– a case for renewable energy NAMA?

The Mexican residential building sector is responsible for approximately 17% of the total energy consumption in Mexico. With the population growing by approximately 1.7 million per year and an increasing number of Mexicans aspiring to better housing, an estimated 600,000 new residential units per year will need to be constructed over the next decade. In the absence of measures to increase energy efficiency, these new housing units would lead to total greenhouse gas (GHG) emissions of approximately 25 $MtCO_2e$ per year by 2020.[74]

To address this problem, in 2012 the National Housing Commission, CONAVI, developed the world's first NAMA in this sector. Today, the Mexican Housing NAMA is one of the world's most developed NAMAs both in terms of technical design and institutional arrangements for support. Therefore, during the 18th UNFCCC Conference in Doha in late 2012, the NAMA Facility announced it would support the Mexican government with its implementation of the Housing NAMA, making it the first NAMA Support Project (NSP).

The overarching goal of the NAMA for Sustainable New Housing is to promote cost-effective energy-efficient building concepts across the residential housing sector with a particular focus on low-income housing—an area in which a large share of the new construction activities are expected. The project contributes to the implementation of the NAMA in two ways: by promoting the penetration of basic efficiency standards in the entire new housing market in Mexico through technical assistance to large public housing financiers and housing developers; financial incentives for small and medium sized developers and financial intermediaries; and by promoting more ambitious energy efficiency standards.

Technical concept of the Housing NAMA

The Mexican New Housing NAMA is based on the whole-house approach. Rather than focusing on isolated energy-efficiency and renewable energy measures in housing, it assesses the global primary energy performance of a building, taking into account building type and climate zone. The concept promotes energy consumption reduction through the interaction and combination of different measures, including passive measures (*e.g.,* reducing building size, shading, thermal insulation, double-glazed windows etc.), the application of renewable energy (*e.g.,* solar collectors for hot water, photovoltaics) and/or the use of highly efficient technologies to cover the remaining

[74] *CONAVI. "Supported NAMA for Sustainable Housing in Mexico - Mitigation Actions and Financing Packages", 2012, p.2*

and unavoidable energy demands (*e.g.,* air condition, household appliances). This approach provides flexibility to private developers, architects and home buyers, allowing them to choose the most appropriate measures to meet the targeted energy saving levels.

Financial support is provided to cover the incremental cost of energy-efficient appliances and RETs in the new houses. Building developers and home-owners are free to choose any combination of interventions that achieve the targeted efficiency level ("efficiency benchmark"). This approach allows for a simple and cost-efficient MRV system that captures the net efficiency improvements of a broad range of eco-technologies, building design, and building materials. It also enables stakeholders to find the most cost-efficient combination of these features. Furthermore, the "tiered benchmark approach" enables donors to target specific activities aligned with their development priorities and provides flexibility for regulators to increase the stringency of the programme over time.

To enable planners, developers and architects to simulate energy demands and meet the required energy-saving levels stipulated by the NAMA, GIZ in collaboration with the German "Passivhaus-Institut" and INFONAVIT developed a simplified tool designed to calculate the energy balance of buildings based on the "whole house approach" – the DEEVi (Diseño Energéticamente Eficiente de la Vivienda). This tool is based on the PHPP (Passive House Planning Package) and has been simplified and adapted to the Mexican conditions. The DEEVi together with the SAAVi (Simulación del Ahorro del Agua en la Vivienda) are part of the SISEVIVE-ECOCASA, a graded sustainability labelling system to certify a new building according to its sustainability level. The label will clearly illustrate a building's energy-efficiency level, as well as the expected savings in terms of power, water, fuel and emissions compared to a reference home. This information will be used both by private developers to certify new residential buildings as well as by buyers to assess the long-term cost savings potential during purchasing decisions.

Perspectives developed a detailed MRV concept under the NAMA to measure the performance of every energy efficiency action and the overall performance of a house. Some of the measured variables include: gas, water and electricity consumption; room temperature; and specific temperature of the walls, floor and ceiling. The mitigation potential is obtained by applying specific emission factors for each mitigation action (NAMA Database 2014, NAMA Facility 2014).

In addition to applying energy efficiency measures, the NAMA has a significant potential to foster renewable energy application in the medium and long-term. Currently, solar collectors providing warm water are already largely deployed in Mexico, and there is also potential for increased use of renewable energy at the residential level, for example through geothermal energy or photovoltaics.

Institutional setup

The Ministry for Agrarian, Territorial and Urban Development (SEDATU), created in 2013, and CONAVI defined a new policy for urban development and housing to pave the way for sustainable urban development at a national scale.[75] This policy focuses not only on residential development, but also on mitigating urban sprawl, including measures related to intra-urban housing, mobility and residential density, while also incorporating new measures that improve quality of life. In 2014, CONAVI re-established the sector-level coordination platform Mesa Transversal – originally established in 2012 – to bring together relevant stakeholders and align technical activities to the new housing policy based on the Housing NAMA.

Financing mechanisms

The public sector was the key driver of residential housing construction over the last decade. Currently, the most important federal housing subsidy programme is "Esta es tu casa", ("This is your home") which was launched by CONAVI in 2007. This programme has made a large impact in the market in terms of the number of homes supported. In recent years, one out of every six homes financed in the country has received subsidies from the programme. The two public housing funds INFONAVIT (private sector employees) and FOVISSSTE (government employees) funded by mandatory wage taxes earmarked for housing (5% of wage) are supporting low-income housing finance. Together, these institutes dominate the market, accounting for 83% (INFONAVIT 72%, FOVISSSTE 11%) of the total amount of mortgages countrywide (June 2013). Completing the picture on the demand side,

[74] *SEDATU, "Programa Nacional de Vivienda 2014-2018", 2013*

the federal mortgage institution SHF has refinanced special and mixed purpose non-bank finance companies who have played a large role in financing housing for low income workers neither salaried in the private sector nor public sector employees.

The NAMA provides financial support to home buyers or developers through financial instruments such as concessional loans or a combination of direct subsidies and loan guarantees (through SHF, for example). CONAVI is also developing financial models to support both the supply and demand side of the housing market, and which channel the economic value created by the NAMA back into sustainable activities. The financing structure of the international support for the NAMA is extremely elaborate and combines various sources as well as grants and loans, as seen in Figure 16.

Lessons learned for overcoming challenges for renewable energy Deployment in the Mexican NAMA

The process of developing the NAMA for Sustainable New Housing demonstrated that, if complex national policy programmes are combined with international level support schemes that are just emerging, significant lead times need to be considered. Combining requirements of domestic as well as international actors – such as donors – can make the development of the NAMA even more complex.

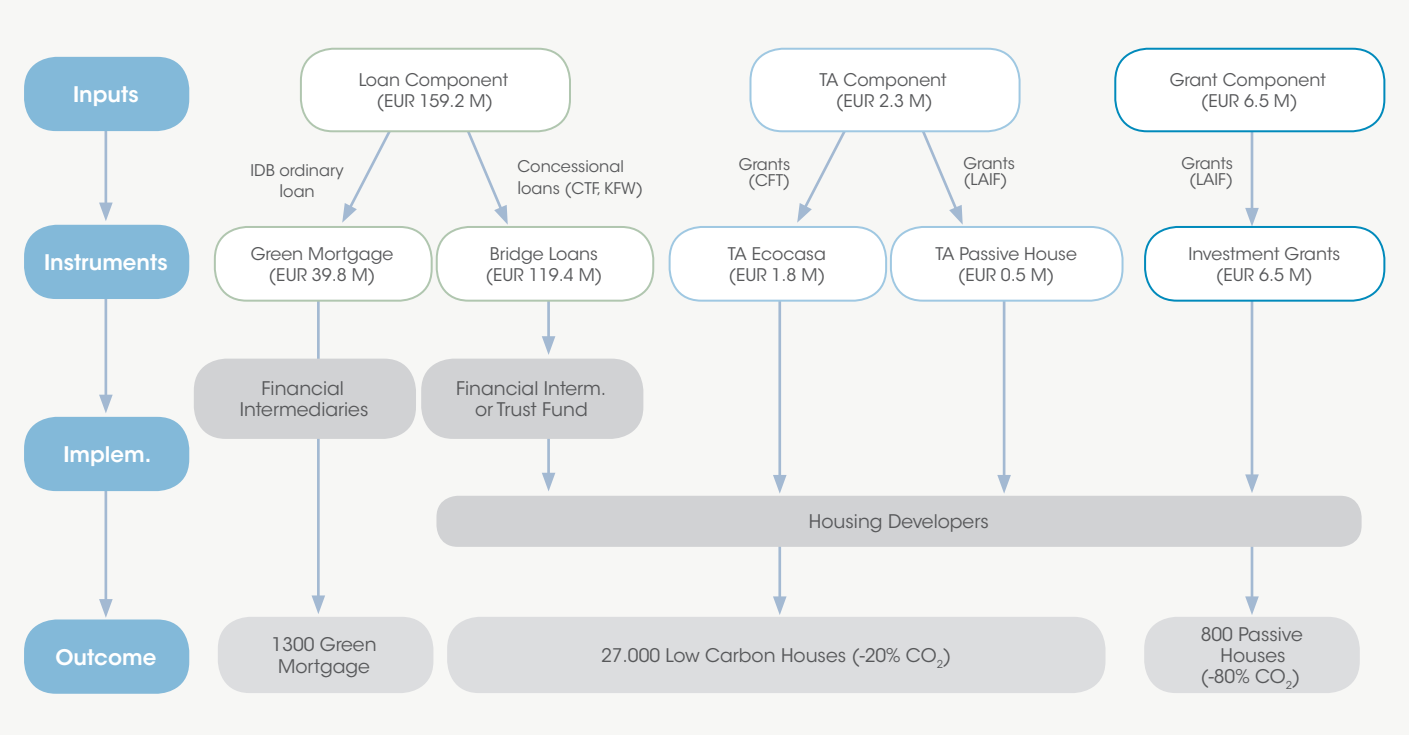
However, there are also lessons learnt that show the complexity of paving the way for a broad implementation of the NAMA, including the following:

- In general, the coordination of the diverse actors and institutions of the housing sector is challenging – each actor also has his / her own particular interest. Under the NAMA, the coordination platform Mesa Transversal was key in overcoming this obstacle.

- Mexico faces extremely different climate conditions (hot and dry, hot and humid, temperate and semi-cold) that require individual and locally grounded technical solutions, which was reflected when planning the NAMA.

- NAMAs can help to overcome certain barriers, such as highly subsidised energy prices. Especially

Figure 16: Financing structure of the Mexican sustainable housing NAMA



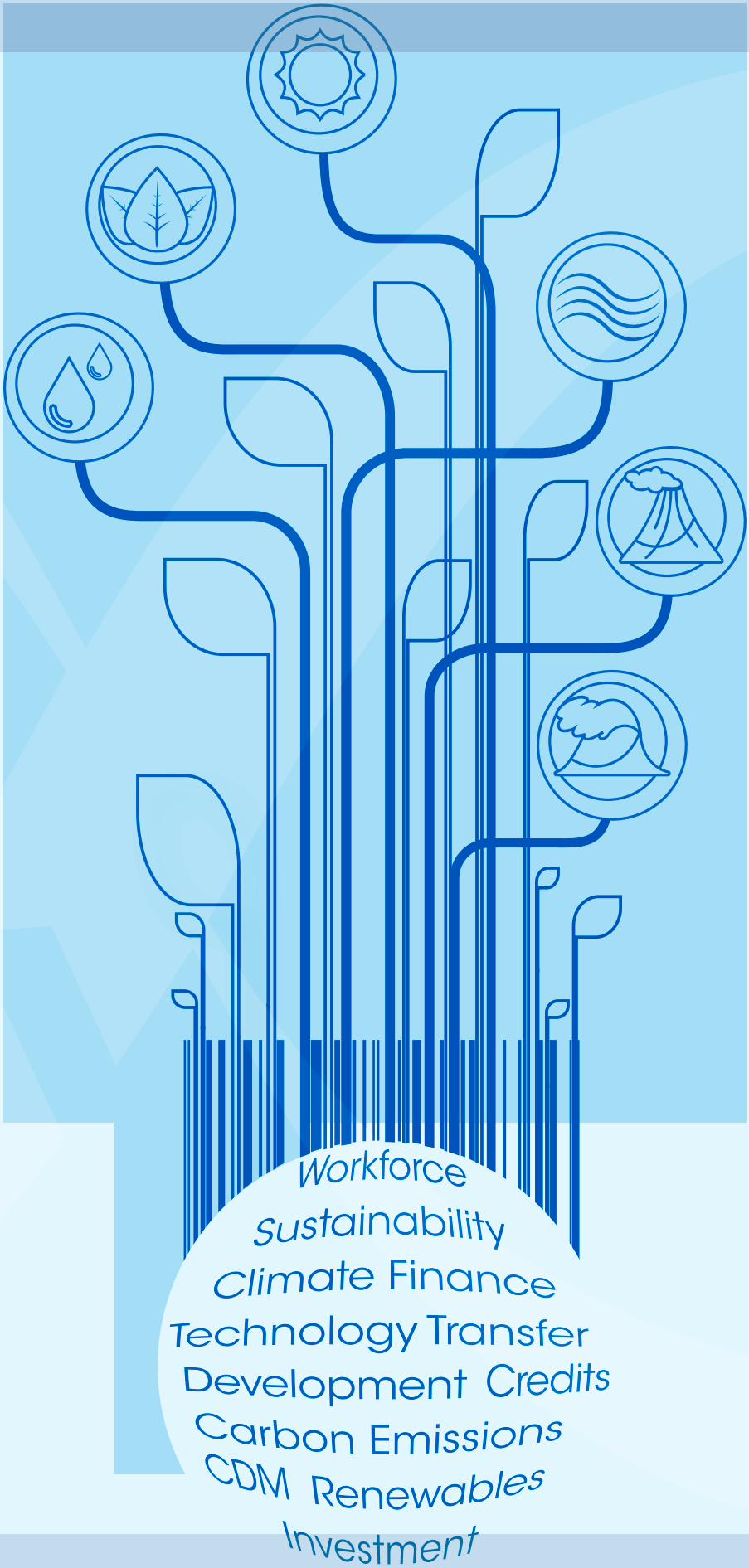
Source: KFW

for the lower-income groups these represent a significant disincentive for home-buyers to pay more for energy-efficient buildings. Reforming the energy tariff system is necessary in order to save government expenditures and shift subsidies for energy consumption instead towards the required measures that incentivise the introduction of energy-saving measures for new homes.

» Building developers are still hesitant to undertake the risk of building more expensive energy efficient homes, fearing that these homes will not find market acceptance. To mitigate this risk, CONAVI is reviewing numerous options that connect the environmental performance of NAMA homes to the financial incentives of homeowners and housing developers.

» On the financing side, the combination of various sources under the NAMA enabled the development of a package of loans and grants that could drive significant activities. However, the economic benefits of energy efficiency for home-owners accrue over the medium to long term. Builders and buyers tend to focus on up-front acquisition costs rather than life-cycle costs, particularly if they do not intend to occupy the property beyond the payback period of energy-efficient equipment – which is currently quite long due to still relatively high investment costs.

The progress of the Mexican housing NAMA suggest that with growing experience in NAMA development and a maturing global NAMA framework, the challenges in elaborating NAMAs will certainly decrease. As a next step, CONAVI is currently developing a second NAMA for existing housing with technical assistance from GIZ within the framework of the Mexican-German Programme for NAMA financed by the German BMUB.


Workforce
sustainability
Climate Finance
Technology Transfer
Development Credits
Carbon Emissions
CDM Renewables
Investment

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