Guidebook for the Development of a Nationally Appropriate Mitigation Action for Solar Water Heaters

Haselip, James Arthur; Lütken, Søren; Sharma, Sudhir

Publication date:
2014

Document Version
Publisher's PDF, also known as Version of record

UNEP

Guidebook for the Development of a Nationally Appropriate Mitigation Action for Solar Water Heaters

United Nations Environment Programme

ISBN: 978-87-93130-16-6

Guidebook for the Development of a Nationally Appropriate Mitigation Action for Solar Water Heaters

Acknowledgements

Co-Authors

James Haselip, UNEP DTU Partnership
Søren E. Lütken, UNEP DTU Partnership
Sudhir Sharma, UNEP DTU Partnership

Special thanks

UNEP would like to thank the following individuals and organisations for providing data, and for their valuable comments and advice:

Amr Abdel Hai, UNEP DTIE; Ghita Hannane, UNEP DTIE; Mauricio Ernesto Zaballa Romero, UNEP DTU Partnership; and Karina Grube Weicher, UNEP DTU Partnership.

Contents

Abbreviations and Definitions

BAU	Business-as-usual
BUR	Biennial Update Reports
CDM	Clean Development Mechanism
GEF	Global Environment Facility
GHG	greenhouse gas
Gt	gigatonne
NAMA	Nationally Appropriate Mitigation Action
SWH	Solar Water Heating
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

additionality	Efforts that go beyond what has already been planned. Project additionality was required under the Clean Development Mechanism to ensure that carbon credits were not awarded for emissions reductions that would happen regardless of whether the project was implemented or not.
baseline	Development that is expected without initiating any additional action to reduce emissions. The baseline is also referred to as 'business as usual', meaning the sum of the current emissions and the anticipated development of emissions over a given period of time (typically the duration of a project or programme).
Biennial Update Report (BUR)	Reports to be submitted every two years by a developing country in its National Communications, in accordance with UNFCCC decision 1/CP.16. Least Developing Country Parties and Small Island Developing States have more flexibility. Reports include information on greenhouse gas inventories, mitigation actions taken, and support needs.
International Consultation and Analysis (ICA)	The process of analysis of the information submitted in Biennial Update Reports by international experts to ensure completeness, consistency and accuracy of information. It also includes consultations among Parties on the analysis and Biennial Update Reports under the Subsidiary Body of Implementation of the UNFCCC to collectively assess the efforts of countries to address climate change.
incremental costs	Costs over and above those incurred by following the baseline development. Incremental costs are additional costs associated with choosing a lower carbon emissions alternative. The term does not indicate which party bears the costs.
monitoring, verifying and enforcing (MVE)	Monitoring is a process to measure and track product efficiency. Verifying is the process through which declarations of product performance by suppliers are confirmed. Enforcing is the legal recourse taken by programme administrators or other responsible parties against suppliers of non-compliant products.
measuring, reporting and verifying (MRV)	Measuring includes collecting information on the impacts of a NAMA. Reporting refers to submitting the measured information in a defined and transparent manner. Verifying requires independently assessing the information that is submitted for completeness, consistency and reliability. The UNFCCC Subsidiary Body for Scientific and Technical Advice is developing guidelines for measuring, reporting and verifying unilateral NAMAs. Measuring, reporting and verifying internationally supported NAMAs will be guided by the supporters and will follow the guidelines for International Consultation and Analysis adopted at the UNFCCC 17th Conference of the Parties.
NAMA	Nationally Appropriate Mitigation Action (NAMA) refers to a set of policies and actions that countries undertake as part of a commitment to reduce greenhouse gas emissions. The term recognizes that different countries may take different nationally appropriate actions on the basis of equity and in accordance with common but differentiated responsibilities and respective capabilities. It is not legally binding on the developing country, but a voluntary undertaking.
stakeholders	AAll persons and institutions that are affected positively or negatively by a given action.
Supported NAMA	A NAMA that involves contributions from third parties in developed countries in the form of finance, technology or capacity-building. Contributions are documented through Biennial Update Reports to the UNFCCC, in accordance with its guidelines in Annex III to Decision 2/CP.17. Developing countries will receive financial and technical support from developed countries for preparation of the Biennial Update Reports.
transformational	The character of an action that emphasizes the permanence of the expected impact. It is contextual, calling for a permanent change to current ways of operation. It prioritizes policy initiatives over projects and sector focus over stand-alone installations, but evaluation is qualitative and non-prescriptive, leaving the evaluation of the transformational character to the stakeholders.
Unilateral NAMA	A NAMA that does not involve contributions from third parties in developed countries and, therefore, is implemented solely using the host country's domestic resources.

1. Introduction

Background

This guidebook provides an introduction to designing government-led interventions to scale up investment in solar water heater (SWH) markets, showing how these interventions can be packaged as Nationally Appropriate Mitigation Actions (NAMAS). Reflecting the changing balance in global greenhouse gas emissions, NAMAs embody the principle of common but differentiated responsibilities. In addition to developed countries' commitments to make quantitative reductions of greenhouse gas emissions, developing countries are invited to contribute with voluntary actions that are 'nationally appropriate' deviations from 'business as usual' emissions scenarios. Such deviations may be captured in low-carbon (or low-emission) development strategies, and then implemented as NAMAs.

The UNFCCC has not provided further formal definitions of NAMAs. It is therefore up to NAMA host countries to interpret NAMAs according to their national contexts. A series of decisions made during the Conferences of the Parties to the UNFCCC since 2007 may be relevant for defining NAMAs. Further, together with UNDP and UNEP, the UNFCCC published 'Guidance on Nationally Appropriate Mitigation Action' in 2013, which provides informal interpretations of the nature of a NAMA. The present SWH Guidebook adopts these informal interpretations.

A NAMA can be regarded as any mitigation action tailored to the national context, characteristics and capabilities, and embedded in national sustainable development priorities. Countries can submit their NAMAs to the UNFCCC's NAMA Registry for assistance in preparation, recognition or international support. Submissions to the NAMA Registry are voluntary. Anyone can develop or promote a NAMA, but only a national authority can approve submission of a NAMA to the UNFCCC NAMA Registry.

During the past five years, the global SWH market, predominantly in glazed and evacuated tube collectors, has grown at an average of 16% annually (Weiss et al., 2008; Weiss et al., 2009; Weiss and Mauthner, 2013). However, average growth is highly variable by country. Some established markets such as China and India have sustained high growth rates over the past five years (19% and 24% respectively), despite having very large markets. These healthy growth levels have been driven by a mixture of government support and market forces, showing that there is significant potential for countries to design and implement SWH programmes and policies to trigger growth that goes beyond 'business as usual'. Such initiatives are obvious and attractive NAMA options.

The Global Solar Water Heating Market Transformation and Strengthening Initiative

A major initiative in support of the broad agenda to scale up investment in SWH technology is the Global Solar Water Heating (GSWH) Market Transformation and Strengthening Initiative. This is a joint undertaking of the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP) and is funded by the Global Environmental Facility (GEF). The objective of the GSWH project is to develop, strengthen and accelerate the growth of the SWH sector. UNEP's Division of Technology, Industry and Economics is leading the knowledge management component of the project, while UNDP is the main implementing agency.

Together with a network of global and regional partners, UNEP's knowledge management initiative facilitates timely, coordinated and professional backstopping for country-specific SWH activities by analysing and disseminating information on lessons learnt and best practices to encourage SWH market transformation across countries globally. In support of this initiative, UNEP has identified a need for a replicable and public methodology to evaluate SWH policy, finance and investment, business, and quality control infrastructure across countries. While several methodologies are available that analyse renewable energy markets or specific SWH market segments,

no methodologies are publicly available that provide a high-level evaluation of national market development opportunities for SWH. To fill this gap, UNEP has published the SWH TechScope Market Readiness Assessment Report [1] (in the following called SWH TechScope Report), which provides stakeholders with a Market Readiness Analysis Tool. The aim is for this tool to be used by policy-makers to benchmark current county achievements against specific objectives, compare these achievements against those of other countries, and set future SWH market and policy goals.

The SWH TechScope Report provides a detailed explanation of the assessment methodology and serves as the instruction manual for the Market Readiness Analysis Tool. The Tool allows interested users to input the relevant data for a specific country and receive a score, with the report covering the first five countries to receive support under the GSWH project (Albania, Chile, Lebanon, India and Mexico), and it summarizes their experiences in establishing and growing a vibrant SWH market. The SWH TechScope is thus an important source of documented experience and best practice that can be used to inform decision-makers in other countries in creating nationally appropriate policies to scale up SWH markets, which in turn could be presented as NAMAs under the UNFCCC.

Getting started

The aim of this Guidebook is be a practical resource for governments (ministries of energy, environment, housing, climate change, finance, planning and others), private-sector investors and civil-society organizations by showing how an SWH-NAMA may be created based on a country-led national strategy. Some countries may already have developed a SWH strategy or be in the process of developing one, such as Tunisia's PROSOL programme, South Africa's SWH Rebate Programme and Mauritius's Solar Water Heater Schemes (1-3). Furthermore, users may have an interest in articulating a NAMA in implementing the strategy, indicating how the country will turn strategy into practice. Articulating the NAMA facilitates communication with stakeholders, including citizens, the private sector, and national and international financiers. With the aid of this Guidebook, UNEP aims to support this process. The Guidebook is divided into four main sections: an introduction to NAMAs; structuring NAMAs for SWH technologies; measuring, reporting and verifying; and financing for NAMAs.

Chapter 2 provides a generic background for the NAMA concept, origin and founding principles, as well as current interpretations among international stakeholders and the UNFCCC Secretariat.

Chapter 3 provides specifics on how to develop a NAMA from a SWH strategy, using UNEP's Market Readiness Analysis Tool to provide evidence and analysis to key stakeholders and potential financiers. The UNFCCC has not yet promulgated strict requirements for NAMAs, but best practices from developed NAMAs, as well as donor and investor due diligence requirements, provide a basis for identifying the evidence needed to present NAMAs.

Chapter 4 introduces the measuring, reporting and verifying of NAMA impacts, including emissions reductions and co-benefits. While the basic requirements have been provided in the form of the decisions of the Conference the Parties, current practices in designing and implementing NAMAs show that accurate interpretation of measuring, reporting and verifying systems adapted to the substance of the NAMA are crucial.

Chapter 5 explains the current sources of financing for NAMAs, and ways in which SWH NAMAs could be financed. It introduces the 'incremental costs' approach as a means of quantifying budgets for 'supported NAMAs'.

Chapter 6 reviews and summarizes the information contained in this Guidebook, and offers brief advice on what steps to take in order to tap the potential of SWH NAMAs.

[1] See http://solarthermalworld.org/content/solar-water-heating-TechScope-market-readiness-assessment-2014

2. Introduction to Nationally Appropriate Mitigation Actions (NAMAs)

NAMAs emerged from the international climate negotiations under the framework of the UNFCCC. They were first mentioned in the Bali Action Plan of 2007,[2] where they are referred to as 'actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity building, in a measurable, reportable and verifiable manner'.[3] NAMAs have inherited central formulations from the founding UNFCCC; these elements (sustainable development, technology transfer, financing and capacity-building) help define the obligations of developed and developing countries. Each successive agreement on NAMAs sustains these elements and provides further details on the different aspects of NAMAs.

Defining NAMAs

A number of elements of NAMAs have been negotiated, but ultimately their nature will emerge through implementation and the sharing of best practices. The national basis for NAMAs allows host countries to interpret what a NAMA means in their own situations and contexts. A first differentiation of NAMAs, that used by the NAMA Registry, is based on different sources of financing:

- Unilateral NAMA (for recognition): entirely financed by the host country;
- Supported NAMA: enabled in part by international technology, financing and/or capacity-building.

Few, if any, internationally supported SWH NAMAs will be implemented solely on the basis of support from developed countries. The host country is expected to contribute to the NAMA financially or through other means, particularly by setting minimum energy performance standards, establishing supporting polices for financing, adopting environmentally sound management practices, and following through by monitoring, verifying and enforcing relevant standards, if any, related to SWH equipment.

Another differentiation is made between policy and programme NAMAs and project NAMAs (UNDP/UNEP/UNFCCC 2013):

- Policies and Programmes are interventions implemented by a government in order to promote or discourage technology options, impact economic activity or change consumer behaviour. Examples for SWH NAMAs include lending programmes for SWH equipment, government subsidies for SWH installations, performance standards for SWH equipment, and mandatory use of SWH in new buildings.

- Projects are specific activities undertaken by private or public organizations. They are clearly limited in duration, scope and geography, but they are generally already of a significant magnitude before they become relevant as NAMAs. Project NAMAs encompass defined activities which typically require technology investments. An example would be an investment to use large-scale SWH in public buildings and facilities or in large-scale city district developments.

---

[2] The Bali Action Plan is the name given to Decision 1/CP.13, which is the first Decision adopted by the Conference of the Parties to the UNFCCC in December 2007 at the 13th Conference of the Parties in Bali.

[3] Decision 1/CP.13, paragraph 1 b ii, document FCCC/CP/2007/6/Add.1

This guide focuses on policy and programme NAMAs. Among international donor agencies there is increasing emphasis on the requirement for NAMAs to be transformational. While there is no definition of 'transformational', the British-German NAMA Facility states that, 'Transformational NAMAs are projects, policies or sector programmes that shift a technology or sector in a country onto a sustainable low-carbon development trajectory'. Such fundamental shifts are most likely to succeed if they are supported by policy or regulatory initiatives. Without embedding initiatives in national legislation, the permanence of the change and thus the transformational character of the initiative may be uncertain. An overview of the NAMA proposals that countries have officially submitted to the NAMA Registry can be found in the NAMAPipeline, hosted by the UNEP DTU Partnership.[4] The Ecofys NAMA Database has information on feasibility studies from 35 countries and on more than 100 NAMAs.[5]

International interest in SWH NAMAs is likely to focus on policy instruments and much less on stand-alone projects. For example, international financiers may require that a NAMA host government first establish and implement a national goal for the roll-out of SWH technology and devise supportive measures like financing schemes as part of the NAMA development, and then invite international participation in a supported NAMA.

Even with the emphasis on policy, NAMAs are actions with a clear emphasis on implementation. An SWH NAMA concerns the implementation of the national energy strategy; it details the tangible, fundable and verifiable activities.

NAMAs might be seen as the future replacement for the CDM, but there are fundamental differences, most importantly that the CDM is a mechanism with detailed rules, while the NAMA is a concept with limited guidance. While NAMAs are expected to involve significant private-sector investment, not least in the financing of NAMAs, it does not foresee the emergence of a new or revitalized international carbon market.

Benefits of developing NAMAs for solar water heating

While NAMAs generally refer to 'mitigation action', it is a common understanding that in most policies that have emissions reduction effects other benefits are the prime motivations for the development of the NAMA. Thus, most often the emissions reduction is a co-benefit of other, more central development objectives of the NAMA host country.

By any standards, the economically feasible potential for increased use of solar water heating applications for hot water preparation nationally can be huge, as this is an economic, commercially viable and available technology, which, however, due to the different market barriers, has not reached the market penetration rate that it could reach simply on economic grounds. The market penetration rates of solar water heating (SWH) vary a lot among countries worldwide, with very high rates in selected countries, demonstrating what can be achieved with active promotion of SWH. On the other hand, few countries have benefited from this technology so far, and there are still significant opportunities for promoting SWH in countries that are lagging behind.

Solar water heating programme and policy NAMAs may be motivated by several objectives.

- A common motivation is the replacement of electric water heaters that require power generation capacity. Power generation capacity may be constrained and investment capital limited for larger scale power generation facilities. Reducing electricity demand, therefore, is a way to postpone such investment needs. Electric water heating is a significant consumer of power and thus an obvious target for policy development with the aim of reducing electricity demand.

[4] www.NAMApipeline.org
[5] The NAMA Database is a wiki that tracks NAMA activities: www.nama-database.org

Table 1 | **Differences between CDM and NAMAs: Evaluation (source: UNDP/UNEP/UNFCCC (2013))**

	CDM	NAMA
Definition	One of the flexible mechanisms of the Kyoto Protocol. It provides 'where-flexibility' in emissions reductions, hence allowing emissions reductions undertaken in a developing country to offset emissions in a developed country, typically through a trading agreement.	Voluntary activities of Greenhouse Gas (GHG) emissions mitigation in developing countries that are not subject to mitigation commitments under the UNFCCC.
Actions	Projects and programmes of activities	Policies, programmes and projects
Initiator	Private sector or public sector	Typically public sector
Investment driver	Normal returns from the market that the project activity addresses with the addition of returns from Certified Emission Reductions (CERs). CERs are issued by the CDM Executive Board based on project verification reports. CERs can be traded on carbon markets.	The sustainable development priorities of the host country with possible added benefits from including emissions reductions in the policy planning. The NAMA may attract international financial participation, and it may include the generation of business opportunities for the private sector, which will invest on the basis of profit motives supported by the NAMA.
Requirement	Reductions in emissions must be additional to any that would occur in the absence of the certified project activity. CDM to assist developing countries in achieving sustainable development.	A NAMA, framed in the context of sustainable development, aims at achieving a deviation in emissions relative to 'business as usual' emissions in 2020.
Financing	Upfront financing, generally through the private sector. Certificates are issued ex-post based on regular verification reports. CERs are sold on a carbon market.	Domestic resources and/or international support (e.g. through bilateral/multilateral agreements, development banks) for the preparation and implementation of NAMAs.
Rulebook	Marrakech Accords and subsequent body of CDM Executive Board decisions.	Limited guidance being developed under the Convention.

- Since the replacement of power generation capacity (future or existing) through solar water heating may also reduce demand for imported fossil fuels and prevent future fuel shortages and price increases, it thus contributes to the diversification of energy sources.
- Replacing fossil fuels-based power production will reduce local pollution from particles, sulphur and NOx.
- It may help reduce the demand for power distribution if remote areas can be supplied by local sources of energy, in which case SWH, combined with solar PV lighting, solar water pumping and possibly wind energy, can establish self-contained off-grid energy systems.
- Local SWH manufacturing and enhanced employment opportunities may also be a motivation for the promotion of SWH, possibly combined with increased product quality through standard setting.
- Support of SWH may be a strategy to reduce the effects of a reduction of energy subsidies.

Thus, there are many possible benefits of SWH policies and programmes. Framing them as NAMAs may have the added benefit of access to external funding, or it may serve as a contribution to national emissions reduction commitments, if any. Unilateral SWH NAMAs may also be used to make the case for international support for other, more capital-intensive NAMAs. Thus, promoting SWH through NAMAs may bring the action into a wider international context, which may provide added benefits in the form of access to financial resources.

Successful Solar Water Heating Programmes and Initiatives

A number of successful SWH programmes have been implemented over the past ten to fifteen years from which experience and good practice can be adopted. This at the same time illustrates that, while the NAMA concept is relatively new, the substance of the initiatives that it is sought to promote through the NAMA is identical to initiatives with positive climate effects that have been promoted under other headings and in other contexts.

The UNDP/UNEP Global Solar Water Heating (GSWH) Initiative: Albania, Chile, India, Lebanon, and Mexico

Funded by the Global Environment Fund (GEF), the Global Solar Water Heating (GSWH) Market Transformation and Strengthening Initiative goal is to accelerate the global commercialization and sustainable market transformation of SWH, thereby reducing the current use of electricity and fossil fuels for making hot water. The project has two components: The 'global knowledge management and networking' component (Component 1) is executed by UNEP, and the 'country program' component (Component 2) which includes specific country programs in five countries (Albania, Chile, India, Lebanon and Mexico) is executed by UNDP.

The international experiences, sector and barrier analysis as well as the in-country consultations conducted in the candidate countries as a part of the project preparation phase, have indicated that the typical support needs at the country level can be clustered under four main and specific subcomponents, which was further tailored and fine-tuned to the specific needs of each participating country:

1. **Facilitate the development of an institutional, legal, and regulatory framework to create a sustainable SWH market**
   Here, the GSWH Initiative works to raise awareness among key national policy-makers of the benefits of SWH technology and facilitate a policy dialogue in participating countries on possible policy measures to accelerate SWH market growth. Among these measures are the development and adoption of building regulations favourable to SWH, as well as different direct and in-direct financial and fiscal incentives. Activities also support the development and adoption of voluntary or mandatory quality control, certification and labelling schemes and build the local capacity to implement and enforce them effectively.

2. **Enhance the awareness and capacity of end users and building-sector professionals to integrate SWH systems into the built environment**
   The SWH industry in most countries consists of relatively small, SME types of enterprises, which have difficulties in launching systematic and effective promotion campaigns themselves. As a market-neutral actor, a national project can cost-share the marketing efforts of the private sector by promoting impartial trustworthy information to the targeted end users, including the financial and environmental benefits of the technology, lists of suppliers and installers etc. The campaign can be broadcast through TV, radio and print media, events leaflets and booklets. The ability to sell the advantages of SWH systems, especially in competition with alternative consumer goods, to prospective beneficiaries, and mobilizing banks to finance these systems are among the most important components of market acceleration.

3. **Contribute to the development of financing mechanisms that increase the demand for SWH systems**
   The GSWH Initiative raises awareness among local financing institutions and other key stakeholders, such as local vendors, power utilities etc., of the financing opportunities for SWH and builds their capacity to design financial products or other delivery models, such as specific solar energy service companies or utility-driven models, which are expected to be attractive to the targeted end users, thus promoting demand. Some project financing is used to support, via risk-sharing, the proposed financial mechanisms as a means to attract private-sector players into the SWH financing market.

4. **Assist in improving national-level SWH certification and quality-control schemes**
   Here the Initiative is strengthening the capacity of manufacturers to improve their product quality and design, as well as improving the business skills of the distribution chain to offer better quality and more attractive services, including after-sales services. The lack of qualified labour to install and maintain solar thermal systems can become a key barrier to market growth. This is particularly relevant for the main market segment of single family houses, as installers often influence purchasing decisions. If installers are familiar with SWH systems, they may motivate potential users to buy them. However, if they are not specifically trained, they may discourage consumers or provide a poor installation, with a negative impact on the functionality of the system and the image of the technology.

The financing models that underpin the initiatives in these five countries are further elaborated in Chapter 5. Other noteworthy examples of successful SWH initiatives are seen in Mauritius and Tunisia.

Mauritius

The Government of Mauritius has embarked on an ambitious programme to transform Mauritius into a sustainable island through the Maurice Ile Durable Project, thereby making it a model for the world in terms of ecological sustainability on a scale which proportionally is considerably greater than what has been achieved elsewhere.

In order to achieve a 40% goal of generation from renewable energy resources in a decade, the barriers to the adoption of additional RE technologies, such as PV and wind energy, have been identified (e.g. lack of institutional financing options; pockets of poverty which are difficult to reach, very difficult to grid-connect) and understood, and thereafter addressed. Already bagasse and hydro-power account for 20% of the country's total electricity generation. The bagasse is obtained from the processing of sugarcane and is used for steam production to meet the energy needs of the sugar factories and for production of electricity for sale to the grid. This amount has been stagnating, if not decreasing, over the years, particularly with the decrease in area under sugarcane cultivation, though demand has kept increasing.

Over the past seventeen years, efforts to move towards a more sustainable society have therefore been directed in particular towards implementing Solar Water Heaters (SWH). The National Solar Water Heater Programme in Mauritius, driven by the Ministry of Environment and Sustainable Development, has offered SWH soft loans through the Development Bank of Mauritius to scale up the usage of SWHs and reduce the consumption of imported LPG and predominantly coal-based electric power. The programme combines an up-front grant with subsidized loans, handled at the time of purchase by the SWH distributor.

The sustainable benefits of this project are high. Out of the 300,000 households that exist in Mauritius, a third would be getting hot water from a natural, renewable resource, namely the sun. Statewise, it represents billions of savings from avoided gas imports and electricity generation. It also represents monthly savings for households of between Rs. 4,000 and Rs. 11,000 per year, representing nearly a month's average salary! This will enable households to free some of their income, benefit from a higher standard of living and therefore boost the local economy, as well as aid other industrial sectors that are facing hard competition due to lower labour costs.

As already mentioned, it is mainly households that have been targeted, but increasingly there is an interest in expanding the programme to potential commercial and industrial end-users and to design it in a financially sustainable way. The programme is deemed a success by the Mauritius government, since it has reached an estimated 20% of the 300,000 Mauritian households, despite facing competition by subsidized LPG-fuelled water-heating systems. However, in spite of the government's commitment to renewable energies (RE), there have been constraints in pursuing a broader and more sustained application of renewable energy technologies (RETs) in Mauritius.

These constraints consist of: (i) technological challenges in connecting renewable technologies to the existing grid without a costly upscale, making it financially unviable, as the present distribution and transmission network infrastructure is not too well equipped to handle additional, variable power flow and load imbalances; (ii) ensuring that (a) the equipment is of high quality and adheres to international standards in order to avoid too much product failure, and (b) advocating that technical service companies set up businesses so that damaged equipment can easily be repaired; and (iii) simultaneously avoiding introducing unfavourable rules and regulations that will impede competition and raise product prices.

Tunisia

Tunisia's energy market is relatively small, with a population of 10.5 million in 2010. With high levels of literacy and education, the country has the third highest human development index ranking in Africa and ranks as the most competitive economy on the continent (40th in the World Economic Forum's global competitiveness ranking 2011-12). Tunisia has excellent solar irradiation levels, with more than 3200 hours of sunshine per year, and estimates suggest that SWH could meet about 70-80% of Tunisia's residential hot water demand (Menichetti and Touhami, 2007). However, despite the large potential that SWH presents, the country continues to rely heavily on (subsidized) conventional fuels, with import levels continually rising (IEA, 2010), as well as electricity for water heating.

Tunisia has a long-standing interest in exploiting its renewable energy resources, as seen in the creation of a dedicated National Renewable Energy Agency (ANRE) in 1985, which was replaced by the National Energy Management Agency (ANME) in 2004. Tunisia's policy support for SWH can be divided roughly into five phases. The country first introduced a solar thermal strategy in 1984, though it showed little success due to the absence of joined-up incentives and persistent system quality issues, namely the poor quality of the SWH hardware and a weak maintenance and after-sales service network (REN21, 2013). By the 1990s, the nascent SWH industry was in decline.

In a second phase, from 1996 onwards, the government aimed to revitalize the SWH market by improving the competitiveness of SWH relative to the dominant conventional LPG option, with a USD 7.3 million project financed through multilateral cooperation (the Global Environment Facility and the Belgian government). The capital cost subsidies involved (35% of the system capital cost) stimulated further SWH market growth. By the end of 2001, when the available subsidy budget (USD 6.6 million) had been exhausted two years ahead of schedule, 50,000 m^2 of new solar thermal panels had been installed, and eight suppliers (including three manufacturers) and over 130 installers were operating in the market, with a total of 260 new jobs having been created (Menichetti and Touhami, 2007).

In the third phase, which followed the abrupt termination of the GEF project due to the depletion of its earmarked funds, the Tunisian SWH market dropped off dramatically, with annual sales more than halving from 17,000 square meters (m^2) in 2001 to 7,500 m^2 in 2005. This negative growth phase can be attributed to (i) the SWH market not yet having reached commercial maturity, i.e. still requiring incentive support, and (ii) persistent non-technical barriers, such as the lack of consumer financing options for SWH, the continued subsidization of conventional fossil fuel options and the negative perception of domestically manufactured systems, despite the introduction of a quality control system (Wuppertal Institute, 2010).

In a fourth phase from 2005, ANME persisted in improving the framework conditions to ensure a sustainable SWH market, which led to the creation of the PROSOL end-user financing facility, initiated by ANME and the state-owned utility Société Tunisienne de l'Electricité et de Gaz (STEG, a former monopoly) with support from UNEP through the Italian-backed Mediterranean Renewable Energy Programme (MEDREP). The objective of PROSOL was to accelerate the penetration of solar water heating in Tunisia by targeting domestic financial institutions (Trabacchi et al., 2012; Ölz, 2011).

Table 2 | **Steps to developing, promoting and implementing a NAMA**

Step 1 Engage key stakeholders	Engage key national stakeholders, promoters and implementers (such as local vendors, power utilities, manufactures, end-users etc.) in a transparent consultation process: a) Ensure active stakeholder support and encourage their public endorsement of the NAMA b) Engage policy-makers and secure the necessary support for implementing the NAMA
Step 2 Develop the NAMA proposal	Develop a structured NAMA proposal based on the national SWH strategy and linked to other national priorities (energy, environment), describing and quantifying as accurately as possible: c) Co-benefits d) Existing policies and actions targeting the co-benefits e) National (financial) contribution f) Measuring, reporting and verifying system, or an intention to develop one g) Estimated greenhouse gas emissions reductions
Step 3 Publish the NAMA	Develop a NAMA proposal in the NAMA Registry format: h) Extract information from the structured NAMA proposal i) Make sure that key information from Step 2 is included Submit the proposal to the NAMA Registry through the nation's NAMA focal point (if established)
Step 4 Finalize and promote the NAMA	Promotion and implementation: j) Ensure that all supporting information has been published k) Circulate NAMA proposal to and meet with relevant donors l) Keep stakeholders engaged m)Further develop the proposal through interaction with donors

Today, some 500,000 m^2 of solar collectors have been installed, and the establishment of PROSOL has resulted in the creation of about 3,000 direct jobs in the solar water heating industry and up to 7,000 indirect jobs. Consumption of 47,000 tonnes of fossil fuels and US$15 million of expenditure on liquefied petroleum gas were rendered unnecessary between 2005 and 2010.[6] (Hannane, Lionetti, Touhami, 2014). Source: Mediterranean Investment Facility, *Building on success stories and partnerships, UNEP, 2014*.

Developing a NAMA, step by step

The NAMA development process is entirely dependent on existing preconditions, and the steps that need to be taken may be many or few depending on the starting point. A NAMA in itself often represents only part of a longer process that may start with the development of a low emission strategy and end with implementation. The UNFCCC Secretariat, together with UNDP and UNEP Risø, has developed non-prescriptive guidance for NAMA development.[7, 8]

Below is a more detailed checklist of things that need to be done partly when developing a NAMA, but mostly when submitting a NAMA and promoting it for recognition or funding. NAMA development takes time and is similar

[6] See also the Climate Policy Initiatives' study of PROSOL at http://climatepolicyinitiative.org/wp-content/uploads/2012/08/PROSOL-Tunisia-SGG-Case-Study.pdf
[7] UNDP/UNEP/UNFCCC 2013.
[8] GIZ has developed a NAMA Tool that outlines ten steps, including strategy and implementation: http://mitigationpartnership.net/nama-tool-steps-moving-nama-idea-towards-implementation.

to policy development. NAMA development involves much more than fulfilling the quite limited requirements for submission of a NAMA proposal to the NAMA Registry; it is an ongoing process.

Table 2 should be considered a general checklist that must be elaborated specifically for any NAMA development process. The main message is that NAMA development is a process rather than an activity with a fixed start and end. In particular, it must be kept in mind that NAMAs do not represent a new type of activity. The checklist above is a brief on general good practice when developing new or revised approaches and policies in any given sector of activity. The NAMA concept adds an international angle to these processes, but it does not essentially alter them. Therefore, when studying the potential for NAMA development, experience with policy development and formulation in related fields is very relevant. In fact, many of such development processes could have been labelled NAMA development had the acronym become established earlier. Therefore, the following examples of the development of SWH policies and programmes are in effect examples of what is being sought through the suggested NAMA development for SWH, with the added benefit that it showcases the initiatives as part of the international efforts to combat climate change.

PROSOL (Tunisia) (UNEP 2014b)

The PROSOL programme, launched in 2005, had a rapid and visible impact on market development. The SWH market in Tunisia tripled within PROSOL's first year with 23,000 m2 (7,500 systems) installed by the end of 2005. In 2006, the 34,000 m2 annual surface area installed surpassed the cumulative capacity installed between 1985-1996. By 2012 PROSOL Residential had helped more than 165,000 Tunisian households obtain SWHs for their domestic water needs, supporting the installation of approximately 500,000 m2 solar collectors. The US$ 2.5 million initial cost of the programme has leveraged a significant investment of approximately US$ 211 million in the period 2005 – 2012 and has turned out to be highly beneficial, as indicated by the following figures:

- US$ 101 million in fossil fuel subsidies are expected to be saved over 20 years (2005 – 2025), of which US$ 15.2 million were achieved in the period 2005 – 2010
- 251,000 toe of fuel as well over the 20 years lifespan of SWHs, leading to a reduction of 715,000 t CO_2
- US$ 605 – 1,325 overall reductions in households' energy bills over the expected SWH's life cycle.
- 3,000 new jobs created, and up to 7,000 indirectly;

Flat-plate collectors constituted the majority of systems, although evacuated tube collectors are steadily increasing in market share, from 2.5% of new installed collector area in 2007 to 17.4% in 2009 (Weiss and Mauthner, 2012). According to the available data, the entire SWH collector area is used for hot water production in the residential and commercial sectors, with no surveyed solar swimming-pool heating (Weiss and Mauthner, 2012). Furthermore, the supply chain expanded substantially after the GEF project (phase 2): the number of SWH equipment suppliers increased to 14, among them six manufacturers, while there were 384 installation firms in operation. Tunisia's sophisticated financial and credit markets and highly educated work force certainly played an important role in ensuring the rapid expansion of credit-based financing for SWH (Ölz, 2011). See chapter 5 for more details on the financial model of PROSOL.

3. Structuring a solar water heating NAMA

Many countries have completed, or will soon complete, significant programmes to scale up the purchase of SWH systems. However, without supporting policies and legislation to incentivise investment in SWH systems, as well as government-led actions to remove the most significant non-financial barriers, rapid technological scaling up is unlikely to occur. Strategies therefore have to be long-term and comprehensive in addressing a range of barriers and ensuring quality control so as to avoid the risk of counter-productive market growth in the short term.

UNEP's SWH TechScope Report contains most of the elements needed to develop a NAMA proposal. Two additional elements are described in this Guidebook: measuring, reporting and verifying (MRV) in Chapter 4; and financing a SWH NAMA in Chapter 5. NAMA proposals present an opportunity for countries to obtain support in implementing their SWH strategies on the basis of concrete, implementable actions. The national strategy should be developed first, in order to provide the framework and objectives. The NAMA follows the strategy, and outlines how the activities will be financed, implemented, measured, reported and verified.

SWH TechScope market readiness assessment methodology

A starting point for the evaluation of the potential for drafting and implementing a SWH strategy is to determine current readiness in the relevant national context. UNEP's SWH TechScope market readiness assessment methodology and analysis is a tool to perform such assessment, potentially benchmarking the country against other countries that have established such strategies. An analysis detailed in the TechScope publication (UNEP, 2014) assesses countries against four interrelated parameters:

1. **SWH Support Framework.** Government policies, regulations and engagement programs have played an important role in scaling up many of the world's leading solar heating markets. For the purpose of assigning scores, the support framework includes SWH targets, financial incentives, loan programs, building mandates and outreach campaigns.

2. **National Conditions.** The relevant national conditions include incoming solar radiation (i.e. insulation), SWH penetration and market growth, energy demand trends, and the competitiveness of SWH compared to other heating fuels.

3. **Financing.** Financing takes into account national macroeconomic conditions, as well as data on access to loans and the cost of financing.

4. **Business Climate.** The business climate is assessed by examining the ease of doing business, the existence of SWH quality standards, and the presence of associations that support SWH.

These four parameters contain eighteen indicators that reflect different elements of the enabling environment for SWH in a given country. The scoring serves as a tool for focusing market and policy discussions on specific issues and providing a starting point for comparisons, not as a judgment on the comparative quality of a given country's enabling environment for solar water heating. Different countries have markedly different conditions that need to be considered in detail on a case-by-case basis; 'best practices' are difficult to define. Therefore, the scoring methodology is intentionally basic and does not take into account factors such as specific policy design, policy duration, or policy interaction.

Developing a national solar water heating strategy

UNEP recommends an integrated policy approach, building upon the SWH TechScope Report, which highlights the importance of a multi-stakeholder consensus incorporating the needs and priorities of the public and private sectors, non-governmental organizations, civil society and financiers. Following the SWH TechScope market readiness assessment methodology, the "SWH Support Framework" parameter (making up 29% of the overall assessment methodology) has five corresponding indicators.

Figure 1 illustrates all four parameters of the SWH TechScope assessment methodology with the "SWH Support Framework" parameter and its corresponding five indicators.

1. **SWH targets.** Quantitative targets can help unify government policy and can also increase investor certainty.

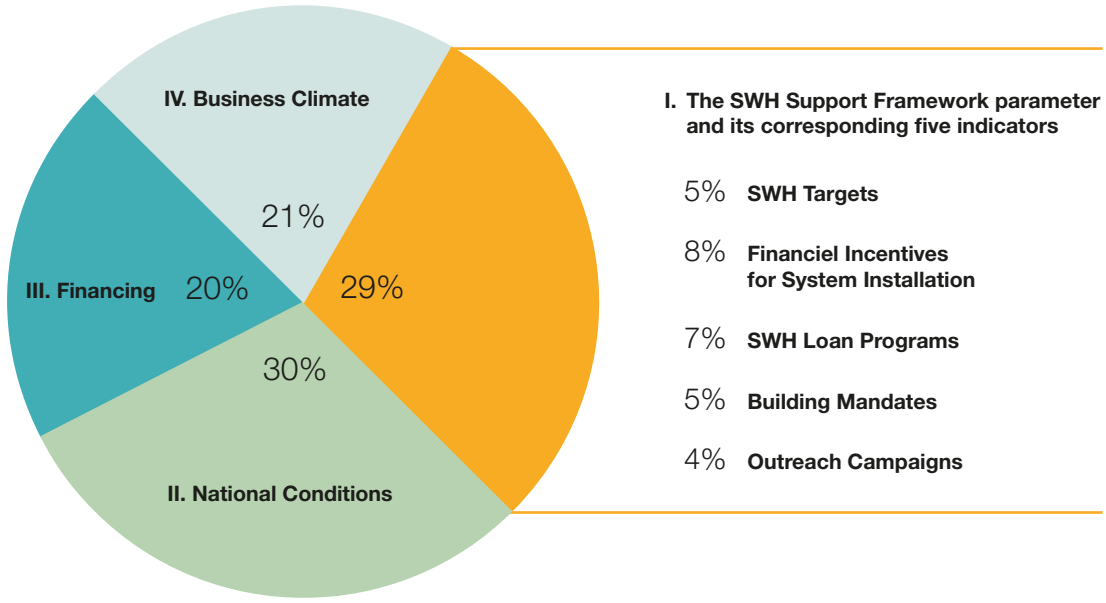
2. **Financial incentives for system installation.** Financial and fiscal incentives for SWHs are designed to improve the economic performance of systems by reducing system cost. Incentives are defined here as direct cash payments (e.g. grants, rebates, performance-based incentives and feed-in tariffs) or tax incentives such as tax credits, income tax deductions, etc.

3. **Solar loan programs.** Government-supported loan programs can be designed to reduce the cost of capital for financing SWH systems, as well as increasing the availability of and access to solar loans. Examples can include low-interest loan programs, interest-rate buy-down programs, and loan loss reserves.

4. **Building mandates.** Building mandates require that solar heating (or renewable heating more broadly) be integrated into new construction and/or major building renovations.

5. **Outreach campaigns.** Government-led or government-supported campaigns to raise awareness of SWH can be an important complement to policies and regulations. Outreach and education campaigns can be designed to target a broad range of different constituencies and utilize different tools (e.g. social media) to encourage the purchase of SWH systems.

Figure 1 | **The SWH Support Framework as part of the assessment methodology**



Text Box 1 | **Minimum energy performance standards**

Minimum energy performance standards are regulatory measures specifying minimum efficacy or efficiency levels acceptable for products sold in a particular country or region. Here, countries should:

- Define the parameters, stringency and implementation period for the standards
- Review existing standards of major markets to learn from best practices
- Specify the minimum efficacy that a SWH product must meet
- Develop a schedule of future performance standards to require greater stringency as more efficient technology becomes available

Write legislation to include or refer to product labelling requirements

Although these support framework elements are not inclusive of all policy regulations, and programs, they were identified as the 'cornerstone' support framework elements by the network of international experts that advised the SWH TechScope Market Readiness Assessment. In addition to the elements listed above, governments are advised to develop minimum energy performance standards and ensure environmentally sound management of SWH so as to maximise their up-front environmental benefits and avoid creating new environmental risks.

Contents of a national SWH strategy

Building on the SWH Support Framework parameter and its corresponding five indicators described above, a national SWH strategy should describe the goals, activities and expected outcomes within a specified timeline and with clearly designated parties. A national coordinating committee may be instrumental in the development of a national strategy, which should contain the following steps:

1. Quantification and justification of the potential benefits of the transition to widespread use of SWH technology, evaluating activities carried out in the past, and presenting key issues and options for action.

2. Identification of goals in the strategy framework, like 'a sustainable and rapid uptake of SWH', 'providing affordable, clean and safe hot water for all households' or 'fulfilling national and international climate change and environmental agreements and conventions'.

3. Identification of up to three objectives for each of the agreed goals. Objectives are specific actions that have measurable results like 'reduce the purchase and maintenance costs of SWH'; 'reduce or shave electricity peak demand' (where SWH is used to replace electric heaters); or 'reduce greenhouse gas emissions by a certain percentage annually'.

4. Identification of a central regulatory framework compatible with existing or planned legal structures. There may be a lack of policies or standards that apply specifically to SWHs. Key legislation should identify the legal instruments in force or to be implemented regarding each of the elements of the integrated approach, such as minimum energy performance standards that rule out the purchase of equipment that does not satisfy the minimum levels. A labelling scheme may also be applied to help buyers recognize high performance and efficient SWH systems.

The development of a SWH strategy is a country-driven process. All the competent national institutions must work on the strategy together, and responsibilities must be identified according to each institution's scope and reach. For example, the Ministry of Energy may have the mandate to regulate the market for SWH and other appliances, the Ministry of Environment (or equivalent institution) is typically in charge of developing laws and regulations on hazardous waste, and the Ministry of the Economy (or equivalent institution) generally has authority

over tax exemptions, subsidies and customs regulations. All entities responsible for the activities proposed in the national SWH strategy must be identified, with pre-defined roles and outcomes described. A national coordinating committee should steer the process and include all relevant stakeholders.

Government must ensure that the national strategy is broadly supported and developed through a multi-stakeholder, participatory process involving and engaging appropriately interested and affected parties in both the public sector (e.g. local power utilities) and the private sector (local manufacturers, retailers, distributors, SWH or RE business associations and investors), as well as civil society (non-governmental organizations and advocacy groups), the finance sector (banking associations, national development banks, local private banks and other financing entities) and technical institutions (SWH testing facilities, universities and other experts). A strong and transparent participatory process ensures that the national strategy takes note of relevant concerns and provides potential solutions to issues that the government may have overlooked. The costs and benefits of the transition are estimated as accurately as possible. Financial sources and opportunities are identified. Based on the financial risk analysis and the plan of activities, the national coordinating committee should ultimately propose a budget, together with financial scenarios supporting the budget.

Moving from strategy to action

Once the national SWH strategy has been satisfactorily completed, the developer of a NAMA proposal works to transcribe the strategy into a practical implementation plan, following the last three steps described in Chapter 2, Table 2. The NAMA process encompasses a wide range of activities: developing the NAMA proposal, submitting it to the NAMA Registry, implementing the NAMA action plan, monitoring progress and reporting its impacts, which are carried out by the various stakeholders. A transparent, nationwide consultation process and strong stakeholder engagement are essential to the successful outcome of a SWH NAMA.

Different organisations supporting NAMAs are likely to provide their own templates for NAMA proposals. The *NAMA Registry format* for the presentation of NAMAs includes basic guidance on how to submit information to the *NAMA Registry*, and may be used as a generic format for the provision of the minimum information requirements, which emerged from the international negotiations under the UNFCCC. Although submission to the *NAMA Registry* is voluntary, it is recommended that the Registry be used to increase the international visibility of the NAMA, but it is also stressed that financiers are likely to require more detailed information and to be involved at an earlier stage.

The overview presented below is generic and does not follow a template format. It includes the relevant elements to present a NAMA for support, based on current experience, and different NAMA templates that have been developed by several organisations. See Annex C for a format used by UNEP Risoe – the NINo (NAMA Information Note).

Elements of a NAMA proposal

The NAMA proposal provides detailed information on the planned mitigation activities, how they will be implemented and monitored, as well as justification for why international support is necessary to support their implementation. Table 3 provides a summary of the main information elements of a NAMA proposal.

Context, background, barriers and proposed solutions

The context and background should include a description of the current SWH situation in the country. Relevant national policies, objectives and laws should be cited, such as energy efficiency policies, existing energy performance standards, product labelling requirements, and national climate change policy and targets. This

Table 3 | **Overview of a solar water heating NAMA proposal**

NAMA Proposal	What should be included?
Context, background, barriers and proposed solutions	• Situation and need for a national solar water heating strategy, linked to national energy, environmental or other strategies • Information on the policy context, current (baseline) situation, institutional context and stakeholders • Description of existing barriers to SWH • Proposed solutions
Scope and objectives	• Description of the scope of the NAMA, its goals and main objectives
Components and timing	• Components should be developed in the context of the identified barriers • Work plan and timeline for implementing the main activities • Key legislation that will be proposed, and the responsible parties for proposing and approving the legislation
Expected impacts	• Sustainable development impacts, including estimated emissions reductions and other positive or negative impacts
Costs and support needs	• Description of the implementation costs of the NAMA, including identification of finance sources and support needs, as well as non-financial support required, such as capacity-building • Budgetary items, per year and for the duration of the NAMA, including anticipated revenues (cash and in-kind support) and expenses
Measuring, reporting and verifying framework	• Description of the framework for measuring • Key indicators to measure progress in implementation • Key indicators to assess impacts, sustainable development and greenhouse gas emissions reductions · Methodology for estimating impacts · Systems and procedures for collecting and storing data • Roles and responsibilities for data collection, analysis and reporting • Reporting format and verifying procedures should conform to the government's and financiers' requirements
Implementation plan	• Details of the planned implementation of the activities: • Institutional framework, roles and responsibilities of various stakeholders • Timeframe • Risk management
Financing plan	• Describes the funding scheme, which may include domestic funds or a combination of domestic and international funds • References the budget for costs and support needs
Responsible parties	• NAMA focal point • Person and organization with overall responsibility for the NAMA • Key institutions and contacts

information serves as both a baseline (starting point of the NAMA) and a commitment to integrate the actions into national policy, both being important considerations for NAMA financiers.

When framing the NAMA, existing barriers to an SWH transition should be identified and analysed, and solutions proposed. Figure 2 distributes economic and financial, regulatory and institutional and market barriers among four central sources. The barrier analysis provides the basis for defining the interventions, that is, the activities that form the core of the NAMA and that should solve the problems posed by the barriers.

NAMA scope and objectives

The scope and objectives of the NAMA include a definition of the SWH technologies covered, the sectors involved (residential, commercial, and industrial) and the geographical range (national or sub-national). The objectives may include:

- High-level policy objectives related to the national climate change and development path, such as improving the energy efficiency of buildings and contributing to national energy efficiency and greenhouse gas emissions reduction targets;

The national SWH strategy may include other goals and objectives not directly related to mitigation, such as achieving growth in off-grid systems (which in some cases could reflect suppressed demand). However, the focus of objectives in the development of a NAMA should be on goals that refer to climate change mitigation activities, even though other benefits than emissions reductions are commonly the actual drivers.

NAMA components and timing

An analysis of the barriers that prevent the elements of the integrated policy approach from being fully or efficiently implemented may help identify specific activities to be included in the NAMA. For example, the lack of a monitoring, verifying and enforcing policy would weaken the impact of a minimum energy performance standard, because non-compliant products may not successfully replace electricity consumption for heating purposes. The analysis section must describe in detail the concrete activities and proposed interventions, and show how they would help overcome potential barriers. Where possible the actions should build on existing policies and processes so as to ensure an integrated approach at the national policy level.

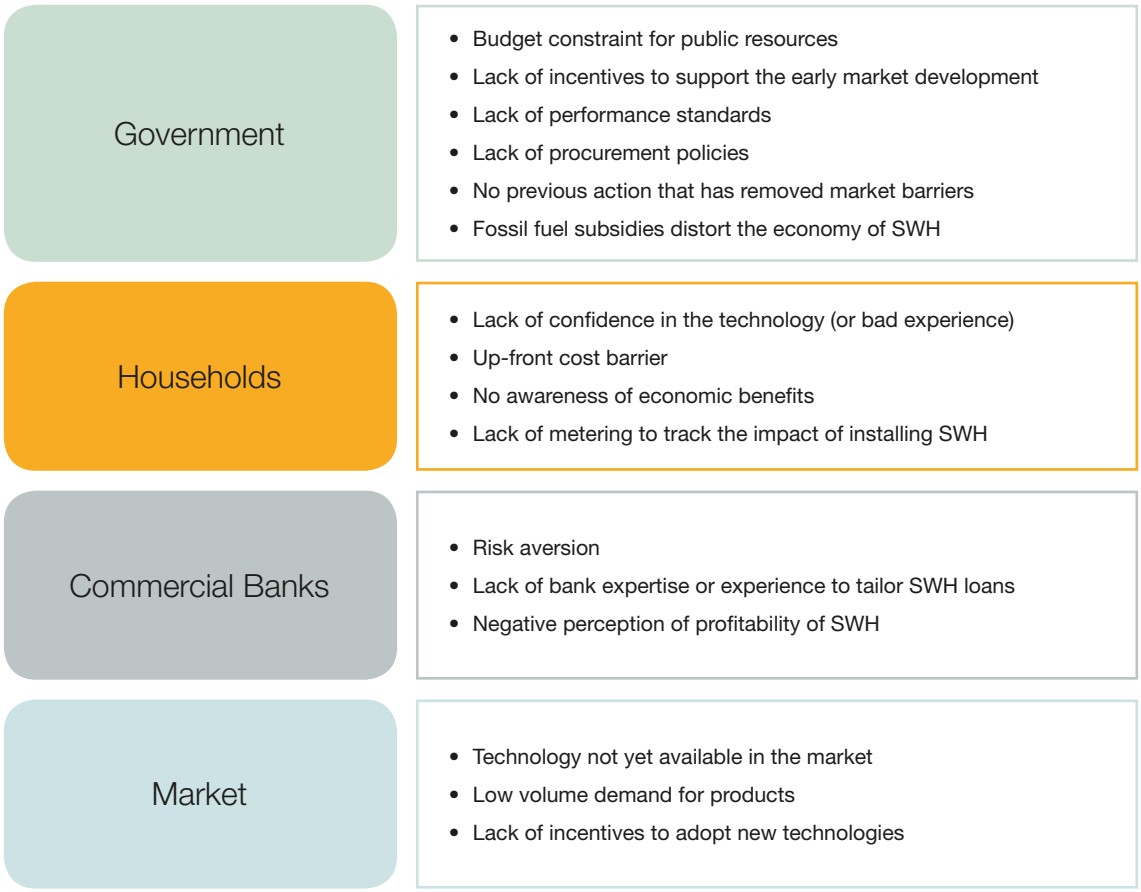
Expected impacts

NAMAs should result in transformational changes for water heating by moving the market along a low-carbon pathway. SWH NAMAs should also reduce greenhouse gas emissions in the context of sustainable development. UNEP recommends that an SWH NAMA proposal should be designed and described with respect to both of these fundamental objectives. The NAMA proposal should estimate the anticipated impacts in terms of expected emissions reductions.

SWH NAMAs are mitigation actions identified in the context of countries' sustainable development objectives. Their implementation should deliver economic, social and environmental benefits.

- **Economic.** The implementation of a national SWH strategy can reduce electricity bills for consumers. Implementation can lower the rate of growth of electricity demand, thus resulting in cost savings associated with avoided additional electricity generating capacity, including government savings from lower dependence on fossil fuel subsidies
- **Environmental.** Reduced demand for electricity compared to the business as usual case, and hence reduced electricity generation, is expected to result in lower levels of air pollution (sulphur dioxide, nitrous oxide and other gases). Lower electricity production could also have benefits such as reduced use of water and other natural resources. As part of an SWH NAMA, a disposal facility for old boiler systems should be established.

Figure 2 | **Barriers to investment in SWH**



- **Social.** The implementation of a national SWH strategy by reducing electricity bills, especially for the lower income section of the population, results in welfare gain in the form of income saved that can be used for other expenditure. An SWH NAMA could also contribute to job creation and economic development by establishing new service areas, such as recycling and test centres.

The NAMA proposal should include an assessment of the expected impacts on a qualitative and/or quantitative basis (for example, the number of jobs created or the expected amount of savings on fossil fuel subsidies). Impacts can derive from specific activities or outcomes, as illustrated in Tabel 5.

The template provided for sharing information on NAMAs in the NAMA Registry includes a section on contributions of the NAMA towards the sustainable development priorities of the host country.[9] This should also be linked to wider national goals, including the national energy strategy and low-carbon development strategies, if these already exist. Compared to the NAMA Registry Annex C contains an expanded template for NAMA description.

Costs, support needs and financing plan

The NAMA proposal needs to provide a detailed assessment of the costs of implementing all the activities under the NAMA. These costs will form the basis of a request for support at the international level and for the design of public finance instruments, which will channel domestic and/or international funding.

[9] Template: http://unfccc.int/cooperation_support/nama/items/7476.php

Table 5 | **Logical framework for possible impacts associated with SWH activities**

Activities				
Develop quality control systems (standards and product specification, testing and certification, and labelling)	Capacity development to enforce quality control system	Guarantee scheme for SWH loans	Awareness creation and capacity development of financial sector to evaluate SWH loans and provide credit	Institutionalized training programmes for SWH installation

Outputs		
Fully functional and operational quality control system to ensure quality of SWH installed	Enhanced access to Finance for implementing SWH	Improved business environment by strengthened market chain for SWH delivery

Outcomes		
Strengthened Solar Water heater support framework Improved consumer confidence and demand	Disbursal of loans for installation of SWHs	Trained manpower for installing SWH

Impacts				
Climate: lower greenhouse gas emissions (compared to business as usual)	Economic: savings in fuel import bill	Institutional: increased capacity to support SWHimplementation of SWH	Environmental: air pollution reduced from avoided fossil fuel-based electricity generation and transport of fossil-fuels	Social: green jobs created

Once the costs have been established, the amount of financial support required is then defined. The NAMA should highlight which elements can be financed unilaterally through public and/or private means. Generally, a high share of host-country unilateral finance is more attractive to potential international financiers because it demonstrates national commitment to the initiative. Other technology and capacity-building needs may be identified, too. The financing plan should include costs, revenues and savings.

Implementation plan

The implementation plan will accompany the NAMA proposal, either as an annex or as a complementary document. It will provide detailed information on the roles and responsibilities of the different actors and stakeholders who will be involved in implementing the NAMA, as well as describing the institutional processes needed to do this. The implementation plan should identify risks and suggest mitigation measures. Alternatively, a separate risk section should be inserted to outline the major risks and possible options for addressing them.

The NAMA proposal should set out how the sustainability and continuity of the expected outcomes can be ensured in the longer term by referencing the long-term aspects of the national SWH strategy and the climate change strategy. Moreover, the NAMA should explain when and how the financiers would conclude their support for the NAMA.

4. Measuring, reporting and verifying

This chapter provides guidance on measurement methodologies, reporting and verification processes and procedures. It briefly explains the measuring, reporting and verifying framework for NAMAs, before describing the elements of developing a measurement methodology for an SWH NAMA.

Framework for developing country NAMAs

This section explains in simple terms the complete measuring, reporting and verifying framework for developing country mitigation actions. In order to understand this framework, it can be divided into two tiers: the measuring, reporting and verifying of the voluntary national mitigation actions of developing countries under the Convention, which can be called the national tier; and the measuring, reporting and verifying of the specific individual NAMAs as implemented by the countries as part of their voluntary national mitigation obligations, which can be called the NAMA tier. The NAMA tier supports the national tier.[10]

National tier

The measuring, reporting and verifying of the voluntary national mitigation actions of developing countries will be conducted at the international level, under the UNFCCC. This tier covers the measuring, reporting and verifying of all the national mitigation efforts and the national greenhouse gas inventory. It includes measuring parameters to prepare the national greenhouse gas inventory; reporting of information on the national greenhouse gas inventory and the impacts of NAMAs implemented by the country, including impacts on greenhouse gas emissions reductions below BAU; and assessment of the information reported in the BURs through International Consultation and Analysis (akin to the verifying step of measuring, reporting and verifying).

NAMA tier

The NAMA tier addresses the measurement, reporting and verification of individual NAMAs. This tier supports the national tier and provides the necessary information on NAMAs for countries to prepare their Biennial Update Reports for the UNFCCC. Unilateral and supported NAMAs will be subject to measuring, reporting and verifying, according to the NAMA tier. The NAMA tier will be established by the country, based on the general guidance recommended by the Conference of the Parties at its 19th session (FCCC/SBSTA/2013/L.28). The guidelines are generic and allow for significant national interpretation for the purposes of developing a domestic measuring, reporting and verifying system. This provides generic guiding principles and/or good practices which countries could use to establish institutional arrangements, as well as modalities and procedures for undertaking the measurement, reporting and verifying of NAMAs. Modalities and procedures will include guidance for developing measurement plans for individual NAMAs, reporting requirements, and processes and procedures for undertaking verification of the reported information. NAMA developers are expected to use the guidance for the measurement plan to develop a measurement methodology for the NAMA and to use the reporting requirements to report the measured information.

Measuring, reporting and verifying internationally supported NAMAs will be influenced by the requirements of the entity providing support. Internationally supported NAMAs will also be subject to international measurement, reporting and verification, in accordance with the guidelines for International Consultation and Analysis adopted at the 17th session of the Conference of the Parties.

The measurement requirements for NAMAs described in this chapter are based on UNFCCC-defined guidelines for the Biennial Update Report regarding information to be provided on planned and implemented NAMAs, and on

[10] UNEP Risø Centre 2013: *Understanding the Concept of Nationally Appropriate Mitigation Actions.*

the approaches used for measurement by various internationally supported climate change mitigation financiers, such as the Global Environment Facility and investors in Clean Development Mechanism projects.

Given the wide range of activities possible under NAMAs, the level of accuracy with which the impacts, especially greenhouse gas impacts, can be measured at a given cost is expected to vary significantly. Also, the level of accuracy required by financial and other stakeholders may vary. Thus, the approach to measurement and verification could vary from a simple approach to a very accurate and sophisticated approach. For example, estimates of electricity saved from the use of solar water heaters based on estimated levels of hot water use, equivalent electricity required, and periodic checks by sampling functioning SWHs may suffice for some NAMAs. The estimates could be increased in accuracy by periodically collecting information through surveys on the use of SWH. The trade-off between the cost/level of effort and precision, which will ultimately be influenced by the current availability of data and opportunities for initiating additional data collection, will also influence the approach to measuring and verifying.

Methodology for measuring, reporting and verifying

Measurement methodologies and procedures

Measurement methodologies and procedures define how to monitor the expected impacts (including greenhouse -related impacts, transformational impacts and sustainable development benefits), progress of (the status of both activities and outputs) and support given to the NAMA. The measurement methodology includes:

- The geographical scope;
- The impact boundaries of the activity on greenhouse gas emissions, as well as sustainable development benefits;
- The baselines for key development benefits and greenhouse gas emissions;
- The indicators to measure the impacts;
- The data required to measure/estimate the impacts;
- A data collection system, including clear responsibilities for the data required to estimate the indicators; and,
- Establishing procedures to ensure the reliability of data collected and estimates.

What to measure in a NAMA

To understand what kinds of measurements are required, the guidelines for Biennial Update Reports, as adopted at the 17th session of the Conference of Parties, outline the following types of information that countries are expected to report to the UNFCCC on NAMAs, both planned and implemented:[11]

- Information on planned NAMAs: progress indicators to track the implementation of NAMAs; methodologies and assumptions related to estimates of greenhouse gas emissions reductions.[12]
- Information on NAMAs under implementation, or implemented: progress of NAMAs under implementation, including the underlying steps taken and further steps envisaged; results achieved, outputs (metrics depending on type of action), and impacts in terms of greenhouse gas emissions reductions.

This is the minimum required information that should be measured for NAMAs. The two broad categories of measurement requirements listed are the progress indicators and impacts indicators of NAMAs, including greenhouse gas impacts. Countries are also required to provide the methodology and assumptions made in estimating greenhouse gas impacts.

---

[11] Annex III to Decision 2/CP.17.

[12] It will also include information on the objectives, and a description of NAMAs, including information on the emissions sources covered in the NAMA (sectors and gases) and quantitative goals; steps envisaged to implement the NAMA; barriers, and related financial, technical and capacity needs, including a description of the support needed.

Table 6 | **Examples of progress indicators**

Goal
Increase use of sustainable energy and reduce greenhouse gas emissions via a rapid and sustainable transition to use of quality SWH

Objectives		
Strengthen the SWH support framework	Enhanced access to finance for implementing SWH	Improved business environment

Activities				
Develop quality control systems (standards and product specification, testing and certification, and labelling)	Capacity development to enforce quality control system	Guarantee scheme for SWH loans	Awareness creation and capacity development of financial sector to evaluate SWH loans and provide credit.	Institutionalized training programmes for SWH installation

Progress Indicators						
Sq m of SWH (or distributed) and in use	# of testing facilities for SWH systems	# of certified SWH system providers	# of staff trained in enforcing the quality control systems	# of financial institutions co-opted into the programme and volume of loans provided	# of sessions conducted (times) (number) of persons trained in financial sector	# of trained SWH installers

Types of indicators

The first categorization of what is being measured concerns either the progress (position relative to the time frame and milestones) or the impacts (results obtained). Both impact and progress indicators should aim to be specific, measurable, accurate, realistic and time-bound ('SMART'), while bearing in mind the trade-off between price and precision.[13]

Progress indicators track the implementation status of NAMA activities (see Table 6). The expected deliverables for each of the activities described in the national SWH strategy are a good basis for identifying progress indicators, as are the indicators and milestones used to measure progress with each of the elements of the implementation plan. Progress indicators may relate directly to impact indicators if the impact is assessed on the basis of reaching certain milestones. For example, a progress indicator for SWH could be the total installed SWH capacity and annual sale per year (number of m^2 of installed collector area per year with the expected annual growth percentage). This indicator is also an important piece of information, along with the area of SWHs systems installed, for estimating the impacts on GHG (see section on data needs for estimating these impacts).

[13] In some cases, it may not be possible to have quantitative indicators and, thus, qualitative indicators may be used to measure progress or impacts. In the case of qualitative indicators, the term 'measureable' does not imply measuring exact quantities, but measuring the perceived impacts. For example, qualitative indicators could be quality perception of SWH among consumers; this could be measured through surveys.

Table 7 | **Examples of impact indicators**

Goal				
Increase use of sustainable energy and reduce greenhouse gas emissions by increasing SWH installations				
Objectives				
Strengthen the SWH support framework	Enhanced access to finance for implementing SWH			
Impacts				
Climate: lower greenhouse gas emissions (compared to business as usual)	Economic: savings in fuel import bill	Institutional: increased capacity to support implementation of SWH	Environmental: air pollution reduced from avoided fossil-fuel based electricity generation and transport of fossil fuelsfuel	Social: green jobs created
Impact Indicators				
tCO_2e reduced	Annual savings of fossil-fuel energy (amount) attributable to use of SWHs	Perception of quality of SWH among consumers	Amount of air pollutants reduced from electricity generation and transportation of fossil fuel	Number of jobs created

Impact indicators refer to the impact of outputs of NAMAs (see Table 6). These are referred to as outcomes in the logical framework analysis, and they relate to the reduction of greenhouse gas emissions, as well as other objectives served by the activity, in accordance with national sustainable developmental goals. The measurement methodology must include indicators for all objectives served by the NAMA, including transformational changes that shift the economy towards a low-carbon development pathway.

The potential benefits identified in the national SWH strategy form a good starting point for identifying and deciding which indicators are useful in measuring, reporting and verifying the impacts of an SWH NAMA on a regular basis. Impacts can be indicated either quantitatively (such as the sq m of SWH installed), or qualitatively (such as the perception of quality of SWH systems).

Implementing the measuring, reporting and verifying process

A measuring, reporting and verifying scheme includes institutional arrangements to oversee the implementation of the process, procedures and guidelines, including a clear definition of the responsibilities of the different actors. Where a domestic MRV system has been established, MRV will be conducted in accordance with the guidelines and procedures of the domestic MRV system for unilateral NAMAs. In the case of internationally supported NAMAs, the country could use the domestic MRV system guidelines and procedures, which may need to be agreed with the entity providing the international support.

The institution that oversees the measuring, reporting and verifying system will be responsible for developing and providing guidance on measurement methodology and reporting, and for defining the process for verification. Developers and implementers of NAMAs will be responsible for developing the measurement methodology and for reporting in accordance with the guidelines.

Reporting

- Reporting entails regular communication from the entity implementing a NAMA to different entities, such as the designated authority that manages the measuring, reporting and verifying system or the entity providing the international support. The parties agree upon the content and format of the reporting templates. The aims of the reporting may include:
- Providing information to the relevant national entity for inclusion in the Biennial Update Report for the *NAMA Registry* (which in the case of unilateral NAMAs would be for recognition), for national policy mainstreaming, for impacts on sustainable development and for co-benefits; and,
- Fulfilling requirements in accordance with the agreement with the entity providing support in line with its requirements in a mutually agreed protocol, especially regarding impacts on greenhouse gas emissions reductions.

The monitoring report for Clean Development Mechanism projects is an example of a reporting template. There are no standard guidelines for reporting on NAMAs at present, so the following principles of reporting can be used to prepare and submit information: feasibility, relevance, completeness, transparency, consistency, accuracy and cost effectiveness.

Reporting frequency for internationally supported NAMAs would be in accordance with the agreement with the international financier. For instance, this could be an annual report on the progress of implementing the NAMA.

Verifying

Verifying confirms that what has been measured and reported (progress in implementation and impacts) is complete, accurate and has been transparently presented, so that a third party would arrive at the same conclusions based on the reported information. What is to be verified (the progress in implementation, greenhouse gas emissions reduction impacts, impact of sustainable development benefits, or a combination of these three aspects) and how the information is verified will depend partly on the domestic and international entities providing support and partly on other national reporting requirements, if any. Below are two approaches that could be used to determine the verification procedure of an efficient lighting NAMA:

- **The Clean Development Mechanism style of verification.** This requires detailed analysis by a specific entity designated to verify the emissions reductions based on data collected in predefined procedures, with or without employing specified metering or estimates of indicators for greenhouse gas emissions, as reported by Clean Development Mechanism project implementers through the monitoring report. This is followed by an on-site visit from the verifier to undertake a sample-based analysis of the measured data to ensure accuracy and reliability.

- **International Consultation and Analysis.** This is equivalent to the verifying step for the Biennial Update Reports to the UNFCCC. The information in the report, including that on NAMAs, is subject to analysis by an international team of experts to ensure that reporting is done in accordance with the guidelines, and that it is complete, consistent and transparent. The analysis and the report will be discussed by Parties to the UNFCCC in order to understand the progress and identify the challenges that the host country is facing in implementing the NAMA.

NAMAs may have a wider scope and be policy-focused rather than project-focused, so the International Consultation and Analysis approach is most likely to be followed for verifying both unilateral and supported

NAMAs. The reports submitted by the entities implementing a NAMA are expected to be thoroughly analysed to ensure completeness, transparency and consistency. In the case of internationally supported NAMAs, depending on the requirements for precision of greenhouse gas emissions estimates and the financing provided, verification of the greenhouse gas emissions reductions could be more stringent. It may use the approach based on sampling, used by Programmes of Activities under the Clean Development Mechanism. It would be natural to seek inspiration here to design a verification system that corresponds to the required balance between precision and cost.

A third party could also perform a detailed review of the NAMA impacts, specifically the emissions reductions, based on the measurement methods and procedures. This is similar to the approach used for the evaluation of policies and programmes implemented by governments, where specifically designated governmental departments (ones that are separate from the departments responsible for implementing the programmes or policies) undertake evaluation to assess the effectiveness of implementation in achieving the objectives of policies and programmes. Indonesia is in the process of developing its domestic MRV system and has proposed that accredited auditors undertake the verification. However, it has not yet been decided whether this will be based purely on a desk review or would involve a more CDM-like investigation.

Specific process requirements for measuring, reporting and verifying support

Developed countries are required to report information on support provided to developing countries through biennial reports and National Communications. Thus, entities providing financing will require information on the utilization of funds, as well as the types of activities supported by their financial contributions, to enable them to meet their reporting obligations to the UNFCCC. This information will be used to assess the provision of climate finance by developed countries in order to improve transparency regarding the support provided and the assessment of global efforts to reach the goal of USD 100 billion of climate change-related funding per year by 2020. Developing countries are also required to provide information on support received and utilized in the Biennial Update Reports. Such reporting would also highlight the funding received and utilized by recipient countries against the funding provided by developed countries, which may include the costs of international administration and international consultants. Thus, entities implementing NAMAs will be required to provide information regarding the appropriate national authorities to enable host countries to meet their reporting obligations to the UNFCCC.

NAMA financiers, whether national or international, will require effective systems for allocating and tracking financial resources for the implementation of NAMAs, so as to ensure that funds are used effectively and for the purposes intended. Entities implementing internationally supported NAMAs should adhere to international fiduciary standards. For example, national implementing entities applying for funds from the Adaption Fund must meet the fiduciary standards established by this fund. Similar requirements will emerge for NAMAs. In addition to fiduciary standards, monitoring of the support provided will also be subject to an agreement between the NAMA host country and the financier that the reporting will be conducted through the appropriate national authority, which is ultimately also subject to verification procedures.

Estimating the Impact of a Solar Water Heating NAMA and Procedures for collecting data

In accordance with the UNFCCC guidelines for the Biennial Update Report (Decision 2/CP.17), the impacts on both greenhouse gas emissions and sustainable development need to be assessed and reported. The estimated greenhouse gas emissions reduction is the expected amount of carbon dioxide equivalent (tCO_2e) that will be reduced as a direct or indirect result of the activities implemented under the NAMA to achieve the NAMA objectives. These should be estimated quantitatively and compared to a business as usual scenario. These estimates are based on measured indicators for outcomes of the activities implemented under the NAMA. For

example, the sqm of SWH installed is needed to estimate the amount of greenhouse gas emissions reduced by this activity. For the purpose of transparency and completeness, the direct and indirect greenhouse gas emissions reductions should be distinguished and reported separately.

Direct greenhouse gas emissions reductions are those that are directly attributable to the activities implemented through the NAMAs. These effects are mediated through an intermediate actor. In SWH NAMAs, the subsidy programme, coupled with quality certification of SWH, will increase the use of SWH in the economy. Thus the direct impact is limited to the amount of resources allocated in the NAMA for subsidization.

Indirect impacts on greenhouse gas emissions are related to the activities of the NAMA without having a direct causal link. These indirect impacts result from the impacts of NAMA activities on the behaviour of people who are responsible for making decisions on the use of lamps. These impacts also include impacts beyond the NAMA implementation timeframe. The following activities are likely to have an indirect impact, along with direct impacts:

- Regulations to set quality standards and to enforce these standards
- Strengthening the capacities for monitoring and enforcing quality
- Accreditation of SWH installers
- Involving commercial banks in providing loans
- Awareness-raising activities

Quality enforcement systems have improved the perceptions of quality among consumers and thus the acceptability of the product. This, coupled with demonstrations of benefits and returns on investment, can increase the acceptability of SWH among consumers. Further, creating an accreditation system for SWH suppliers and installers also improves the experience and acceptability of the product by reducing the risks of failure. This affect is strengthened by awareness-raising. Another indirect impact could be a general improvement in the perception of solar energy products, thus having an indirect impact on other solar energy production programmes. Similarly, accreditation of SWH installation providers creates capacity which could influence capacity for other solar production installations, thus lowering the costs of solar products and enhancing their capacity. The involvement of commercial finance providers enhances their capacity to understand solar products and thus increases the availability of finance for other products. Some of these impacts cannot be directly measured, but they could be assessed qualitatively to express the expected impacts.

The following section provides further details on the calculation of emissions reductions from the use of SWHs. From a donor's perspective, conservative approaches are more appealing than overly optimistic assessments. However, in contrast to the Clean Development Mechanism, the NAMA provides a greater degree of flexibility in the calculation of impacts and the use of indicators. This could also yield significant variations in the level of accuracy in greenhouse gas emissions reduction estimates from the measured outcome of activities, depending on the estimating model employed. In cases where high accuracy could be achievable, but at a high cost, conservative estimates, benchmarks and average factors are likely to be acceptable to financiers.

- The time frame for estimating emissions reductions is related to the period over which the impacts of implementing the NAMA are realized. The shortest timeframe is the NAMA implementation period, when activities included in the NAMA are implemented. However, in most cases, and in conformity with the objectives of transformational change, impacts will be realized well after the implementation of the NAMA. An obvious example of this is the implementation of minimum energy performance standards that could be central in the implementation of an efficient lighting NAMA. Thus, the choice of timeframe should also reflect the planning horizon of the national initiative.

- It may be beneficial to link the NAMA to internationally discussed time frames for achieving significant deviation from baseline emissions. For example, the UNEP en.lighten initiative[14] has a target date of the end of 2016 for the global phasing out of inefficient incandescent lamps. The target year of 2020 is often used in negotiations in the Conference of Parties decision for demonstrating deviations from business-as-usual greenhouse gas emissions. It is expected that most of the reductions in greenhouse gas emissions will occur beyond the completion of activities of the NAMAs. Therefore, calculations should state the reductions during and beyond the implementation phase, at least until 2020. For supported NAMAs, the duration of the financial involvement of a third party may set another target date for achievements under the NAMA.

Beyond these strictly emissions reductions-related achievements, most NAMAs are expected to achieve sustainable and transformational developments in the targeted sector. In relation to sustainable and transformational impacts, NAMAs should result in the long-term, permanent transformation of a sector towards a lower greenhouse gas emissions pathway. To secure long-term transformations, NAMA design should ensure the sustainability of impacts beyond the implementation period. A NAMA is one way to transition rapidly to a system where the use of SWH does not have to be supported and becomes a competitive option. For example, a NAMA could include a requirement to periodically assess the viability of SWH and integrate this assessment with the policy and regulatory framework for the use of various forms of energy.

Calculation of Greenhouse Gas Impacts from the Use of Solar Water Heaters

Detailed calculations, sources and figures should be included where possible. Relevant methodologies developed for the Clean Development Mechanism could be employed because these are internationally approved methodologies and are likely to be acceptable to international partners. Clean Development Mechanism Methodologies AMS-I.J [15] and AMS-I.C [16] are being used successfully in project activities related to solar water heating[17]. Emission reductions are calculated as the energy savings that result from the project implementation multiplied by an emissions factor for the electricity and/or fossil fuel displaced.

In the case of SWH systems replacing electricity consumption, there are three different ways of calculating emissions reductions, depending on whether the electricity being displaced is from the grid, from off-grid fossil fuel-fired captive power plants, or a mixture of the two.

The equation below is a simplified generic model for estimating the emissions reductions for SWHs replacing electricity consumption:

$$ER = EC \times EF \times (1+TDL)$$

ER: emissions reductions from saved electricity consumption (tCO_2/yr)
EC: quantity of electricity that would be consumed by the baseline electricity consumption source (MWh/yr)
EF: emissions factor for electricity generation[18] for source (tCO_2/MWh)
TDL: average technical transmission and distribution losses for providing electricity to source

[14] The United Nations Environment Programme (UNEP)-Global Environment Facility (GEF) en.lighten initiative was established in 2009 to accelerate a global market transformation to environmentally sustainable, energy efficient lighting technologies, as well as to develop strategies to phase-out inefficient incandescent lamps to reduce CO_2 emissions and the release of mercury from fossil fuel combustion.
[15] https://cdm.unfccc.int/methodologies/DB/GX9DV8QFP9X8BNR5GI1UUJD55EJ03A
[16] http://cdm.unfccc.int/methodologies/DB/H2PMYUBPE9H1DP9S0WB470N5EKU1NP
[17] One may also refer to the methodology proposed by ICLEI for its Cities programme. http://southasia.iclei.org/fileadmin/user_upload/documents/MRV_draft.pdf
[18] The UNFCCC 'tool to calculate the emission factor for an electricity system' can be found in the link below: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf/history_view

In the case of SWHs replacing fossil-fuel combustion, the equation below shows a simplified generic model for estimating the emissions reductions:

$$ER = FC \times COEF$$

ER: emissions reductions from saved fuel consumption (tCO_2/yr)
FC: quantity of fuel type combusted in process (mass or volume unit/yr)
COEF[19]: CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

The key information and data needed to estimate the greenhouse gas emissions reductions of SWH programmes include:

- Characteristics of the baseline system, including the fossil fuel or electricity input and output capacity
- Average temperature of water entering the water heating system (e.g., ground water temperature) and average end-use hot water temperature and consumption
- Types of SWH systems to be covered in the NAMA (residential/commercial use/technical specifications)
- Characteristics of the SWH systems, including solar collector size and technical and thermal performance, collector orientation, back-up system characteristics, pumping system characteristics, and storage tank size and insulation
- Average solar radiation data, i.e. daily or monthly average daily solar insolation data (kwh/m^2/day) and ambient temperature data, i.e. daily or monthly average daily values
- Estimates of penetration of each SWH system type used in the accounting period
- Reliable local or national data on emissions factor for displaced fossil fuels, or IPCC default values if national data is not available
- Annual emissions factor for displaced electricity if the SWHs replace electricity
- Transport and distribution losses and emissions factor (may need to be calculated by region)

Emissions reductions are estimated against a business-as-usual scenario. This describes the total electricity and/or fossil-fuel use, including the installation rate of SWH systems in the absence of the NAMA. Establishing the business-as-usual case requires information on:

- Existing use of SWHs for a given base year and expected rate of growth of SWH use
- Current level of SWH systems in the market
- Rate of growth of installed SWH systems in the market over past few years
- Expected change in policies and regulations regarding SWHs (in the absence of the NAMA), and assessment of their impact on the use of SWH systems
- Impact of projects and programmes to promote the use of SWH systems, under implementation or planned for implementation
- External factors, such as imports of SWH systems, prices of SWH systems, electricity prices, fuel prices or other factors that may affect purchasing or use behaviour

Business as usual can be established either by expert judgement, based on the available data, or, by using models. The use of projection methods depends on the availability of data and the level of accuracy desired. Modelling does not guarantee greater accuracy, but it does enable the implications of various factors on the use and penetration of SWH systems to be understood. The trade-off is between the resource intensity of the estimate and the accuracy of the estimate.

[19] The CO_2 emission coefficient is calculated based on the chemical composition of the fossil-fuel type, or the net calorific value and CO_2 emissions factor of the fuel type. See the 'Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion'.

The second key parameter in estimating is the efficiency of the various baseline devices supplying hot water. The efficiency could be taken as that of the most efficient device available in the market. Such information would be easier to collect and would produce conservative estimates of emissions reductions. If more accurate estimates are needed, information could be collected based on a survey of sales of devices in the market and by estimating average efficiency for all devices in the same fuel category type. This would require data for both the efficiency of different devices and the share of each device in total sales.

Energy generation, i.e., the energy in the solar water, could either be estimated or based on measurements of hot water supplied by the SWHs[20]. The energy generated could be estimated using the following equation:

$$EG_{th,y} = C_{SWH,y} * UO_{SWH} * \%U * \%0$$

Where,
$C_{SWH,y}$ = total installed capacity of solar water heater (m^2)
U_{OSWH} = maximum unit output of SWH in ($TJ/m^2/yr$)
%U = fraction of utilization, i.e, actual utilization rate of the total water heated by SWH.
%O = fraction of SWHs installed that are operational.

The information on the maximum unit output of SWH could be estimated using either simple calculations or models. This gives a theoretical maximum amount of hot water that could be produced based on the local availability of the sun, solar incidence, etc. One such model is SOLO, a recognized model calculating the energy output of SWH developed by the Centre Scientifique et Technique du Bâtiment (Scientific and Technical Centre for the Construction Industry), one of Europe's leading research and test laboratories in the solar thermal area in Europe' (http://international.cstb.fr/frame.asp?URL=overview/task.asp).

In the case of electric solar water-heaters, the transmission and distribution losses can also be used to correct the electricity used for heating water on site.

The information on utilization rates, as well as proportion of functional SWHs, could be collected through survey methods, which could also be used to collect a number of data parameters. CDM methodologies provide guidance on undertaking surveys. Surveys are undertaken in many contexts, and this is an area where most countries have capacities. The key aspect to build into the surveys is that the sampling design should be representative of the relevant variations. In the case of SWH, the key variations would be weather conditions, solar conditions, income class of the residential households, size of SWHs and, if commercial sector too is included, the whole range of commercial organizations covered by the NAMA.

The entity responsible for implementing a NAMA, as identified by the host country, has the primary responsibility for measuring progress and reporting on the indicators. For an effective measurement system, the responsibility of all the partners involved in implementing a NAMA should be identified. Information to assess the transformational impacts of a NAMA should be integrated with national data collection systems, including specific institutional or regulatory changes, if relevant. Such institutional and/or regulatory changes and their associated timelines would equally be captured in the implementation plan, which defines the role of all stakeholders involved in a NAMA. The cost of the development and operation of a measuring, reporting and verifying system may be significant and so should be integrated in the overall cost estimates.

[20] Measuring the hot water supply by measuring the temperature of the supplied water and the quantity of water supplied is not a feasible option for all SWHs installed. This could be done through periodic survey, taking into account the variations in hot water use by seasons. The estimation methodology for this approach is mentioned in AMS I.C.

The key information to collect for such programmes is the capacity of SWH installed. The key players involved in installing SWHs and providing finance could be the source of the information. The design of data collected for this system will depend on the design of the NAMA. If the NAMA is based on providing financial incentives through mechanisms established through the NAMA, then the entry point for such collections could be the channel through which the financial incentive is provided. For example, in PROSOL, the banks provided loans as part of the programme. So the information on total SWH systems installed could be based on the data base of loans provided as part of NAMA in order to establish the SWHs. If the system of incentives involves subsidies on capital investment, then the authority providing the subsidy could be the primary source of information on the SWHs installed. Further, the system used to verify installations could be the basis of collating information on SWHs installed.

One of the key player in the SWHs is the companies providing installation and maintenance services. System could be developed to involve them in collecting information on systems installed and their specifications by categories. If the provision of subsidy is linked to certification of installation, then the collection of information could be connected to the release of subsidies. Government could enact regulations for annual reporting requirements for reporting on the systems installed by companies and link it to certification of the companies. Similarly it could also provide incentives for reporting such information annually. Further, countries have systems for collecting various socio-economic statistics. These systems could be used in creating additional fields for collecting data on SWHs systems. These could include information on households using SWHs, sources of financing for SWHs, levels of satisfaction with the functioning of the system, etc.

Text Box 2 | **Sampling guidance for measuring emissions reduction from SWH.**

For SWH, like in any other activity that involves a large number of small installations, it is not practicable to monitor the use of every single installation. The costs of doing so would simply be prohibitive. Under the Clean Development Mechanism, particularly related to Programmes of Activities that specifically target such small-scale installations, sound principles for sampling have been established and could/should be adopted under NAMAs as well. The CDM principles are lined out in the methodology "AMS-II.L. Demand-side activities for efficient outdoor and street lighting technologies, version 1.0", but the principles are universally applicable. Refer to the General Guidelines for sampling and survey for small-scale Clean Development Mechanism project activities.

- Sampling must be statistically robust and relevant so that the survey has a random distribution and is representative of the target population (size, location).
- The sampling size is determined by a minimum 90% confidence interval and a 10% maximum error margin.
- The method to select project installation sample locations is random.
- For a monitoring survey, individual SWH shall constitute the population constituents when determining sample size and distribution.
- If SWH installations vary in size and purpose, the SWH should be categorized according to size and use and each group shall represent unique population sets for sample sizing and sample location selection.

5. Financing a NAMA

This chapter provides guidance to the NAMA developer in designing a financing strategy, structuring a NAMA that meets financiers' interests and requirements, and structuring the financing of a SWH NAMA, including the possible involvement of international financing. It includes advice on the details of incremental costs and ways to approach financiers with a NAMA concept note or proposal. Financing a SWH NAMA is of key importance in the planning process and should be considered at the earliest stages of NAMA development.

NAMAs will be integrated into current policies and current budgets. Only a few NAMAs, if any, will not have any relationship with other activities and budget lines of the national budget. Therefore, familiarity with the national budget is crucial to the way in which NAMA financing comes together. Current budget lines illustrate current priorities in the sector and reveal allocations or priorities that are undesirable in terms of emissions reductions. With budgetary information in hand, the financial structuring of a SWH NAMA becomes much more reliable, which in turn makes the evaluation of financing the needs from third parties better informed. Figure 3 provides an overview of the overall structure of NAMA financing for unilateral and supported NAMAs.

Structuring NAMA finance

The financial plan for a NAMA presents financial instruments and vehicles (with their respective amounts) for the implementation of the NAMA. It contains the entire financing of the action. For internationally supported NAMAs, this means that not only the part for which international third-party financing is invited should be presented. The plan may or may not be based on private-sector financial involvement. In most cases, the financing structure will have to be adjusted to different financing partners' requirements and suggestions. Financiers should be regarded as important advisers in maximizing financial resources or reducing financing costs. NAMA developers should initiate consultations with financiers at an early stage in the development of the NAMA, rather than waiting until the full NAMA proposal has been developed.

Figure 3 | **Sources of financing to support NAMAs (Sharma and Desgain, 2013)**

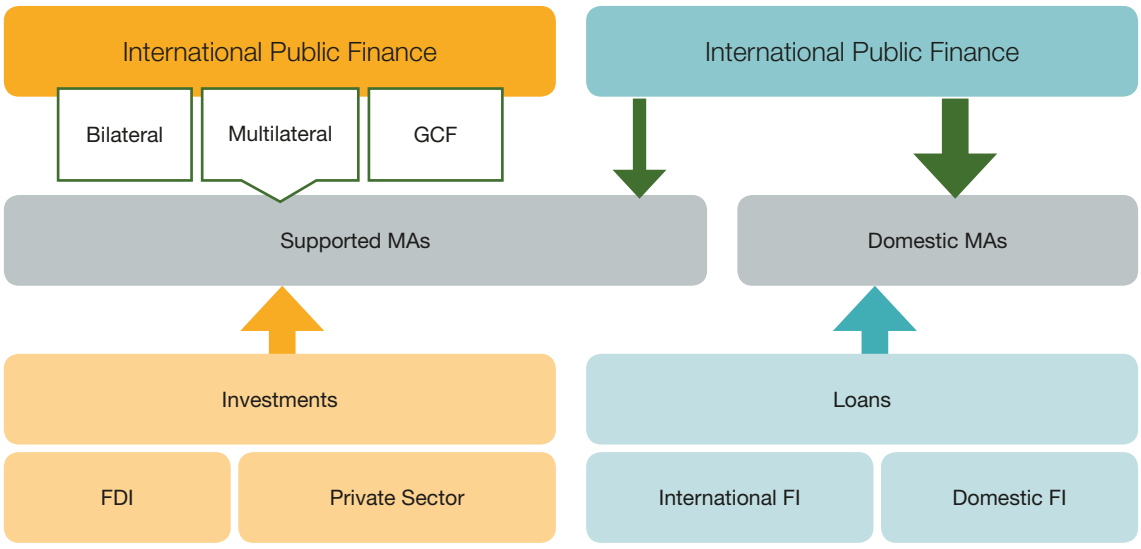


Table 8 | **Examples of financial and economic instruments enhancing the demand for SWH systems making available attractive end-user financing mechanisms and new delivery model**

NAMA component	Encouragement of Household to use SWH	Encourage building owners from the Service Sector to use SWH	Encourage building owners from the Industrial Sector to use SWH
Barrier	Lack of awareness of benefits and life cycle costs of SWH	Unfamiliarity with new technology and concern about higher initial costs	the large range of temperatures to contend with, a factor that must be considered when choosing an appropriate solar technology Lack of awareness of the government of the potential of solar thermal application in the industrial sector
Government	Tax rebate on SWH systems to make them more competitive towards electric heaters Tax electric water heaters	Provide support cost subsidy to levelaized the playing field with heavily subsidized conventional	Provide Support cost subsidy coupled with Interest rate subsidy Provide Bonus tax on the subsidy avoided on fossil fuel Tax rebate on the purchases of solar equipment
Utility	Grant or co-funding of SWH equipment Host professional training sessions for service providers Use the billing system of the state utility in order to recover the loans provided by commercial banks Bulk purchase	Finance capital costs through energy performance contracting Offer rebates to encourage uptake of SWH	Act as a coordinator to a national programme, harmonize the procedures to get access to the financing incentives
Local banks	Offer discounted loans to qualifying business owners Structure a financial product for SWH (discounted consumer loan with a longer maturity)	Use bank facilities as best-practice demonstration sites	Provide grace periods on credit repayments Use specific credit lines offered by IDBs with a lower interest rate and longer repayment period
Energy consumers	Calculate savings over full life cycle of SWH systems	Instruct users and maintenance staff on how to best use SWH systems	provide general knowledge to end-users about solar thermal applications for process heat, solar concentrating technologies and solar thermal simulation software
Local companies	Manufacture, demonstrate, distribute and install SWH systems	Energy service companies undertakes energy savings calculations	Solar thermal plants modeling

Structuring financial and economic instruments and vehicles

The main barriers to the implementation of mitigation activities are often financial and economic constraints or disincentives. The design of the NAMA includes the solutions proposed in the SWH strategy, showing how policy interventions, in the form of financial and economic instruments, can be used effectively to address specific barriers to the implementation of NAMA components. Involving stakeholders early in the strategy and the NAMA process allows for the design of instruments and mechanisms that are feasible and that can be combined to address a specific barrier. For example, a country could combine a subsidy for SWH with retirement premiums for used electric water heaters. The subsidy could be partly financed through a marginal reduction in fossil-fuel subsidies.

Table 8 presents examples of financial and economic instruments that could be used to overcome barriers to a SWH NAMA and leverage domestic or international financing.

Countries that have already implemented SWH programmes have chosen different approaches to the financing of initiatives addressing the different barriers. In Chile, for instance, in August 2009 the government passed a law establishing a tax credit for construction companies that could be applied to SWH installation costs in new homes. The tax credit was set to remain in force for five years (2013), and the government allocated US $300 million to finance the incentive. The tax exemption was launched in 2010 and significantly changed the context in which the project operated, and from 2009-2010 SWH installations increased from 28,159 m^2 to 39,079 m^2. As a result, the project adjusted its focus from assisting the government in developing a legal framework to supporting implementation of the law by supporting the responsible institution, promotional activities and training. As the law has been rolled out, the project has drawn attention to limitations in its design and implementation. Thus, the law was amended to extend the period of time, to expand the coverage of the tax exemption to individuals and households, and to incorporate some compulsory elements such as mandatory certification of installed solar thermal systems.[21]

Making available attractive end-user financing mechanisms and raising the awareness of the local financing institutions has also been important. Building their capacity to structure and introduce new financing products or other delivery models or apply existing ones, such as specific solar energy service companies or utility-driven models, has been essential.

Albania, on the other hand, established a small grants program, co-financed by the UNDP, which was used to install SWHs in some of the most hot water-intensive public buildings in Tirana, Thethi, Petrela and Preza. These included public health centres, social centres and shelters. The project has also carried out many SWH feasibility and technical studies for specific public buildings. In 2012, the UNDP and the GEF Small Grants Programme provided eleven guesthouses with SWHs in the tourist area of Theth.

UNDP also supported the development of the financial incentives established under the Jawaharlal Nehru National Solar Mission (JNNSM) in India, greatly influencing the growth in the SWH market. The UNDP piloted two industrial SWH units using ESCOs to install, own, operate and provide water heating services to Soya Koya Sterring Limited (35,000 LPD capacity system) in Sriperumpudur, TN, and to Wheels India Ltd (105,000 LPD capacity system) in Padi, Chennai. In addition to the subsidies or concessional loans that the ESCOs could obtain under the JNNSM, the project provided further funding to cover 15% of the total cost of the projects. Under the project, the ESCOs will provide heating services for up to five years, after which the SWH system and its operations will be handed over to the commercial user at no cost. The industrial user pays a fixed monthly amount to the ESCO, and in return the ESCO meets the industrial water heating needs of the users. As a result

[21] Another project in Chile proposed a new financial incentive in partnership with the Ministry of Housing and Urbanism (MINVU) that would be independent of the tax credit, focusing on developing SWH for existing low-income housing. The project will install one or two centralized solar thermal systems for 20 to 40 social housing units. MINVU will implement this activity with the goal of establishing a new financial mechanism. Based on the outcome of the pilot project, beginning in 2016, solar thermal systems could be installed for up to 5,000 households at a cost of US $2,500 per household, totalling US$12.5 million.

of switching from fuel oil to solar-powered water heating, the users' monthly water-heating costs have decreased by 50%.

In South Africa there is around 500,000 m^2 of installed SWH capacity. South African manufacturers produce a wide range of systems, from very basic integral systems that require little plumbing to more elaborate active, split collector systems. The up-front costs of typical residential SWH systems are on par with the worldwide average, with prices ranging from $5.50 to $9 per litre of capacity. Government support for SWH has generally been limited, but there are a few programs to stimulate markets for SWH and other small-scale renewable energy technologies.

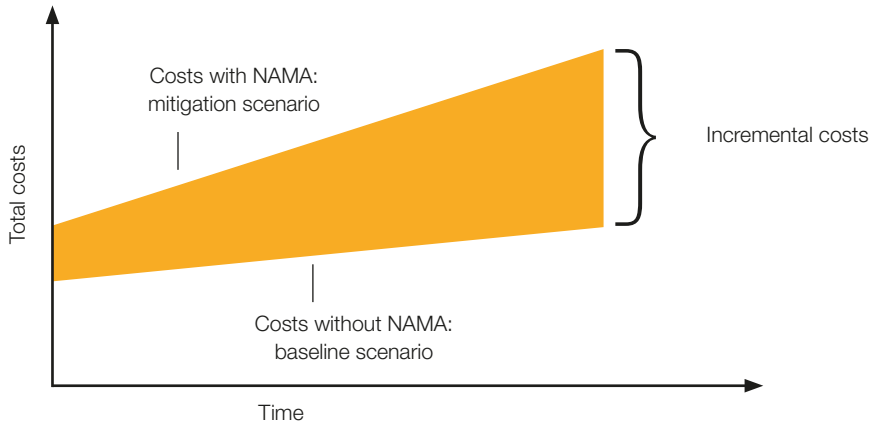
One such program is the ESCO model or 'fee-for-service' mechanism suggested by the Renewable Energy and Energy Efficiency Partnership (REEEP) and Sustainable Energy Africa (SEA) for the large-scale deployment of SWHs in South Africa. The ESCOs play a key role in co-coordinating the model in each area of their jurisdiction. It could be a public or a private company that puts together a suitable SWH financing package, drawing on the Eskom DSM incentive, carbon financing and/or bulk financing deals. The ESCO is also able to negotiate a reduction in current SWH unit costs through the mass purchase of systems. It enters into a contract with the SWH users, installing and maintaining the systems in individual households at its own cost while retaining ownership of the system and selling hot water to the owner/business by metering the hot water/volume, entering into a lease or hire-purchase agreement for a fixed period, or offering a fixed monthly fee.

UNEP is also supporting the City of Cape Town. In the programme's first five years, the city aims to establish a strong SWH market with reliable service providers and products, and boost the local SWH supply industry so that it can compete in national and international markets, with a goal of 140,000 SWH systems installed in Cape Town by 2017. UNEP has provided technical and financial support to the city to develop and structure a financial support mechanism by working with banks and other lending institutions to make instalment finance and bulk funding more available for financing products and the industry itself. The introduction of retail lending into the financing solution allows these institutions to use their own billing and collection facilities and to operate through a direct debit system.

Similar approaches are seen in Brazil and the Caribbean, where the Fee-for-Service Model has two main options, either 1) sale of energy programs or 2) system leasing or rental programs. Sale of energy programmes can be supplied to residential, commercial and industrial users of hot water and do not require any capital investment by the customer. The utility company or another energy service provider (like ESCOs in the above example) owns, installs and services the solar water heating system. These arrangements can be structured as a 'shared savings' or 'performance' contract, whereby the utility will charge a lower rate than the conventional electricity costs for the solar energy generated and supplied to the customer. For example, the charge to the customer might range from 90% of current electricity costs to as low as 75% of current rates to heat the hot water. In that case, the customer would realize a 10-25% savings for heating water. The rate the utility charges for the energy sales can be fixed or tied to a percentage of the prevailing conventional electricity rates. The rates can be adjusted periodically, or may be fixed for the life of the contract.

Under the leased and rental options, the SWH systems are owned by the utility company or energy service provider, though the fee structure is not based on the metered sale of energy. Leasing equipment is common in the business sector and is used as a method of financing equipment purchases. A leased item is owned or financed by a third party, who will typically realize a tax advantage by depreciating the item while receiving a fair price for the use of the product being leased by the customer. The value of a product, both at the beginning of the lease and its remaining value after the lease has expired, is used to determine the cost of the lease. The consumer's payments cover the declining value of the product and a margin of profit for the leasing company. A SWH lease program operated by a utility company would work in a similar fashion.

Figure 4 | **Incremental costs**



Thus, SWH system financing can come in various forms, including:
– retailer financing (e.g., the customer pays the vendor in monthly instalments),
– bank loans (structured as corporate loans, secured personal loans, micro credit, supplier credit)
– third-party financing (leasing or ESCO / performance contracting)

No matter which financing model is chosen, one of the main lessons learnt in using different government financial and fiscal incentives to stimulate the SWH market is that short-term incentive programs may disrupt that market. Therefore, whatever incentives are applied, they should be long-term.

Such instruments and mechanisms are also essential in attracting international financing from both public and private sources. For instance, a development bank may be interested in providing a credit line to a local bank that provides loans for SWH systems, as a consequence of a grant offered by the government to lower the interest rates on those loans. National financial contributions may leverage international funding, demonstrating to the international counterpart a national priority and risk-sharing capability and willingness.

Some instruments may be more appropriate than others, depending on the host country's general economic situation and level of development. Grants and concessional loans are a preferred option in low-income countries, while a broader range of financing instruments will be available in middle-income and transitional economies.

Calculating incremental costs

International financing for NAMA implementation may cover 'incremental costs' above a business-as-usual scenario, as illustrated in Figure 4. The Global Environment Facility (GEF) has interpreted this as 'additional costs associated with transforming a project with national benefits into one with additional global greenhouse gas mitigation benefits'.[22]

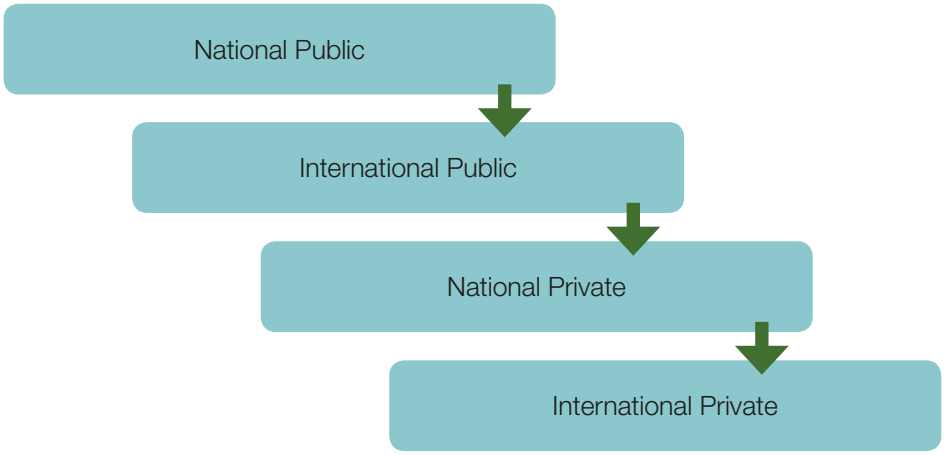
For instance, the choice could be solar water heating instead of conventional fossil fuel-based electric water heating. The lifetime cost difference between the two options is the incremental cost. Unfortunately such calculations are never that simple, and a number of decisions about what to include in the calculation and what not to include may obscure the picture. A third approach would be to structure the national finance and the financing model and financial instruments as efficiently as possible, respecting national principal constraints, and devise a structure for the lowest cost option to fill the financial gap. This may or may not be the incremental

[22] Incremental Costs and Financing Modalities, Global Environment Facility, 1995.

Table 8 | **Examples of cost items**

Scenario	Objective	Cost items
Baseline scenario	Electric water heating	• Purchase and installation • Maintenance • Energy costs
Mitigation scenario	Solar Water Heating	• Purchase and installation • Maintenance • Quality control costs • Institutional capacity building for municipalities and lending institutions Measuring, reporting and verifying costs

Figure 5 | **The right order of leveraging (ref. S. E. Lütken 2014)**



cost. Particularly, the financing challenges associated with high capital cost, low operational cost equipment such as SWH cannot be disregarded. It is also obvious that the less efficient the financing model, the higher will be the incremental cost. Most likely the final determination of incremental costs may be negotiated with any prospective financiers.

Identifying sources of financing

The financial engineering of NAMAs may be guided buy 'the right order of leveraging' as suggested by Lütken (2014) and as adopted by the UNFCCC NAMA Guidance, illustrated in Figure 5.

The leveraging model emphasizes the importance of domestic financial participation, identifying which financing elements can be met domestically, and which require international financing so as to demonstrate how this will contribute to the activity.

Domestic and international financing may include both public and private sources, as illustrated. The public sources, both national and international, should generally be structured in a way that leverages private investment. In the case of SWH investments, purchasing the equipment will first and foremost be undertaken by the private sector (private households), whereas the financial support required to make this purchase the more attractive

option must originate in a public budget. The *refinancing* of such expenditure is part of the financial engineering of the NAMA and may include national taxes and levies, reductions in subsidies, international concessional lending or, but rarely, a grant from an international donor. However, as NAMAs are intended to foster transformational changes, they implicitly assume a permanent shift in the financing model employed in a sector. Such shifts will be achieved by activating long-term financing arrangements that will most often involve national public recurrent spending budgets signalling permanent shifts in financing priorities.

In PROSOL, the government aims at increasing the private sector's share of the financing by gradually reducing its financial involvement in the programme, as illustrated in Figure 6.

Annex D lists potential funding sources for SWH NAMAs.

Domestic financing

Domestic financing includes budgetary support from public institutions as well as private sector investment. The following stakeholders may play a key role in mobilizing domestic financing for SWH NAMAs:

- Government, such as the national energy agency or Ministry of Finance
- Power utilities or independent power producers
- Energy service companies (ESCOs)
- Suppliers of SWH products and services
- Banks and other financial service institutions
- Electricity consumers

Many of these stakeholders can contribute to the design and choice of policies, economic instruments and financial vehicles (such as taxes, loans, grants, rebates or capital investments) that can be used to channel domestic financing toward specific NAMA components.

Domestic public financing is essential for attracting international financiers, as illustrated in Figure 5, and in setting framework conditions that make private investment attractive. Depending on the host country's circumstances and abilities, a strong domestic financial contribution will increase the attractiveness of the NAMA for international participation. Domestic financing may be directed towards 'no regrets' actions that are cost-neutral or that yield a net profit. The latter would be obvious targets for private-sector investment. Conversely, if there is no national contribution, or no national readiness to restructure the financing to achieve transformational changes in a sector, the attraction for international funding may be limited. For instance, it may be difficult to convince international financiers to compete with national fossil-fuel subsidies.

International funding

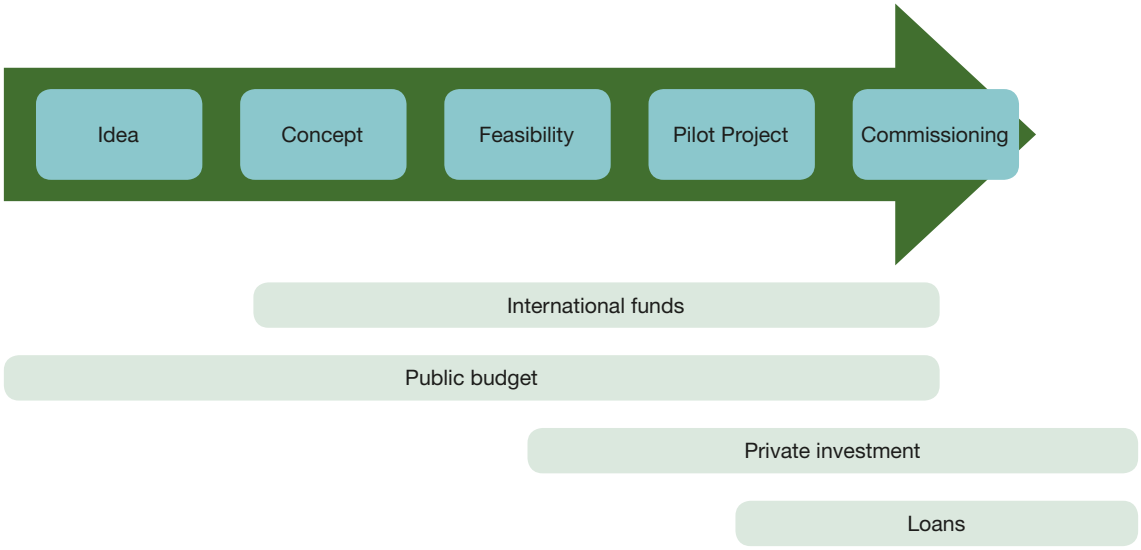
International funding for NAMAs has focused on supporting readiness activities, such as institutional capacity-building and preparation of concept notes, through either bilateral or multilateral programmes.[23] Most of these programmes have been financed from the 2010 to 2012 'fast start financing' of USD 30 billion, agreed at the 15th Conference of Parties. International partnerships have also emerged from these programmes to build knowledge and share views on NAMAs among various institutions.[24] Dedicated initiatives and sources for financing NAMA implementation are emerging, such as the NAMA Facility and the prospective Green Climate Fund.

---

[23] For example, the Japanese International Cooperation Agency (JICA) and the Ministry of the Environment of Japan offer support in NAMA design and implementation. This funding is usually bilateral and based on requests from the host country.

[24] For example, the International Partnership on Mitigation and MRV (http://mitigationpartnership.net/) and the NAMA Partnership (http://www.namapartnership.org/).

Figure 6 | **Involvement of financiers in the Prosol project**



Text Box 3 | **The NAMA Facility & The Green Climate Fund (GCF)**

Announced in 2012, The NAMA Facility, established jointly by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, and the United Kingdom Department of Energy and Climate Change recently posted its first call for NAMA project outlinesa. "The Facility is designed to support developing countries that show leadership on tackling climate change and want to implement transformational country-led NAMAs. By this means, models should be explored for how NAMAs can be delivered within the existing global mitigation architecture in the short term"b. As its first project, The NAMA Facility intends to support the implementation of the sustainable new housing NAMA of the Mexican Government.

- Type of financing available: grants, concessional loans and guarantees.
- Budget: EUR 70 million (Germany's funding of EUR 40 million is from the Special Energy and Climate Fund; and, the UK Government's funding of GBP 25 million is from the International Climate Fund)
- Access modalities: open calls for NAMA projects, and selection by The NAMA Facility Board[c]
- Delivery channels: KfW Development Bank, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), and other bilateral and multilateral qualified delivery organizations
- Geographic and sectoral scope: all developing countries, all sectors

One of the most important statements in the guidance to The NAMA Facility is that proposals require the full support of the developing country receiving The NAMA Facility funding. Written documentation proving the full endorsement by the responsible national ministry or agency for the implementation of the NAMA support project must be included in the outline (templates are provided). In addition, proposals need to demonstrate evidence of successful consultation with the respective national ministry responsible for the coordination of official development assistance, in order to ensure a broad commitment for the proposed project within the government of the partner country.

The Green Climate Fund aims to become the main global fund for climate change. It was established in 2010 to support projects, programmes, policies and other activities in developing countries, including NAMAsa. It is expected to channel a significant portion of the USD 100 billion that developed countries have pledged to mobilize by 2020 for mitigation and adaptation purposes in developing countries. Funding from the Green Climate Fund is not expected to be available before 2014. Access modalities, financing instruments and selection criteria for projects, including NAMAs and private sector support for NAMAs, will be developed by the Board and the Secretariat of the Green Climate Fund.

Some developed countries have announced funding for the implementation of NAMA activities in specific countries.[25] A range of existing bilateral and multilateral funds offer funding to countries for mitigation activities without explicitly targeting NAMAs.[26] Existing programmes offer support opportunities for sector-specific actions, as does the Renewable Energy and Energy Efficiency Partnership. Other development finance institutions continue to provide technical and/or financial support for mitigation measures in various sectors, though without a dedicated 'NAMA financing window'.

Private-sector financing

SWH programmes can be attractive investment opportunities for both domestic and foreign private companies if they are profitable – or can be made profitable through public-sector intervention – in a life-cycle assessment. Private-sector intervention requires financial structuring that allows a return on the investment. For example, Energy Service COmpanies (ESCOs) enter into contracts that allow them to invest in energy-efficient equipment and finance it through the savings on the energy bill. Such contracts are sizeable and, therefore, challenging for the domestic household market, but they may function well with the public sector or large commercial customers. The private sector only invests if the risk/return ratio is acceptable; its involvement in energy service companies may require public-sector intervention that reduces risks and barriers, or increases returns.

The private sector, especially the technology providers, also can contribute to non-market activities, such as awareness-raising and marketing campaigns, to increase the use of SWH systems. To identify opportunities for private financing and involvement, international and local private-sector stakeholders should be consulted during the NAMA development process through dialogues or workshops. Such dialogues will help to identify the potential barriers to private-sector investment and involvement, which can then be addressed by targeted public-sector interventions as part of the NAMA and help leverage private-sector finance.

Other sources of financing

Bilateral financial institutions have extensive and long-standing experience in supporting traditional mitigation projects and are increasingly becoming involved in the international support of NAMAs. A review of the pilot and relevant activities of four bilateral financial institutions highlighted the measuring, reporting and verifying process, the funding channels, involvement with the private sector and the opportunities to utilise market mechanisms. 'One of the key insights is that NAMAs should be mainstreamed into national development strategies to make the proposed actions "nationally appropriate," engaging planning, finance and line ministries, together with environment ministries. In addition, efforts should be intensified to produce financially viable and sustainable NAMA proposals, which can withstand the due diligence of financial institutions.

Meeting international financiers' requirements

The type of information that financiers may expect from a NAMA developer is shown below, although different financiers will require different types of information. Central issues include:

- Well-designed proposals that transparently incorporate extensive domestic stakeholder consultations
- Detailing an ambitious but realistic work programme capable of implementation. For example, the NAMA may focus on a region, and be phased in successive periods based on previous successes
- Identifying a NAMA developer with a relevant mandate and appropriate technical and financial capabilities.

Investment motivations may be divided between greenhouse gas-related criteria, as shown in Table 9, and non-greenhouse gas related criteria, as shown in Table 10. Both tables indicate how these criteria could be applied to SWH NAMAs.

---

[25] For example, Norway for Ethiopia and German institutions for Mexico, as noted by L. Cameron et al., 2012, *Annual Status Report on Nationally Appropriate Mitigation Actions.*

[26] For example, the Global Environment Facility and the International Climate Investment Funds.

The initial proposal to any financier should refrain from being too specific in its request for financing. It should be left to a dialogue with financiers how the financing may be applied most efficiently, including the deployment of different instruments. Different instruments have different cost profiles and may directly influence the cost of the NAMA. The NAMA Registry, however, requires such information (See Table 11). Therefore, submission to the NAMA Registry will succeed after the structuring of the financing has been discussed with potential financiers.

Table 9 | **Greenhouse gas-related investment motivations**

Greenhouse gas related criteria	Application to SWH NAMAs
Cost-effectiveness of emissions reductions	Ratio of emissions reduced by the replacement of electric water heaters, versus costs to implement the NAMA.
Direct and indirect mitigation potential	Direct and indirect emissions reductions expected from the replacement of electric water heaters (tCO_2e).
Mitigating capacity	Refers to a country's ability to reduce greenhouse gas emissions in the longer term. In the context of SWH strategies, enabling activities to build institutional structures for measuring, reporting and verifying, for example, improve a country's ability to achieve long-term emissions reductions, going beyond the immediate target sector.
Long-term transformational potential and replicability	Transformational change is achieved through targeted strategic policy interventions which go beyond, for example, the mere replacement of electric water heaters. It may include regulatory changes or awareness-building activities aimed at making the programme sustainable in the long term.

Table 10 | **Non-greenhouse gas-related investment motivations**

Non-greenhouse gas related criteria	Application to SWH NAMAs
Sustainable development benefits	The achievement of sustainable development through the NAMA will enhance the country's ownership, and will be considered a guarantee of the NAMA's continuity in the long term.
Ownership and domestic funding (including co-financing)	National ownership can be demonstrated through the involvement of high-level decision-makers during the stakeholders' consultative process, and through domestic (public) funding for specific NAMA components.
Robust measuring, reporting and verifying systems	As the measuring, reporting and verifying of a NAMA is necessary to assess the emissions reductions achieved by the NAMA's activities and the use of support provided to such activities, the financier may have specific expectations in that regard.
Alignment with national priorities	Demonstrates how the NAMA will contribute to the achievement of development or environmental objectives, and specifies if, and how, the NAMA is embedded into existing governmental strategies.

Table 11 | **NAMA Registry-required information**

	Request of support for preparation	Request of support for implementation
Costs		
Estimated full cost	Costs and time frame of activities associated with the preparation of a NAMA, including: • Background and feasibility studies • Technical assessments and designs • Consultations with stakeholders • Selection and prioritisation of NAMAs	Costs and timeframe of activities for the implementation of the NAMA during its entire lifetime, including: • Pre-operation activities (legal, administrative and other costs) • Construction works • Operation and maintenance • Debt service for industrial facilities • Closure
Estimated incremental costs of implementation	Not applicable	Incremental cost is the difference in cost between a baseline scenario and a mitigation scenario
Support required		
Financing	• Total amount of financial resources that are needed for the activity (preparation or implementation), and amount provided from the national budget • Type of financing instrument (debt, equity, guarantee or grant), and amounts needed from third parties	
Capacity-building support	• Type of capacity-building support (institutional development, human capital, systemic: policies, legislative, regulatory) • Amount of capacity-building support to prepare or implement the NAMA (for example, training of personnel, institutional strengthening activities, or e–learning programmes). • The amount of support could be expressed in monetary or person/hour terms.	
Technological support	• Development of domestic framework conditions for adoption of certain technologies	

Text Box 4 | **The Role of the NAMA Registry in financing**

The NAMA Registry serves the dual purposes of presenting NAMAs for recognition and providing a platform where NAMA host countries and NAMA financiers can meet. The Registry provides templates for the submission of NAMA proposals. Although recommended, it is not mandatory to fill in all the information fields. Additional criteria that reflect the interests of international financiers should also be considered when selecting the NAMA and designing the NAMA proposal.

Some international funding requirements can be deducted from the information requested for the submission to the NAMA Registry. It is less certain, however, if the NAMA Registry will eventually be a useful platform for directing financing to NAMAs. It is more likely to serve the purpose of announcing financing agreements established through other channels, such as The NAMA Facility.

THE PROSOL CASE

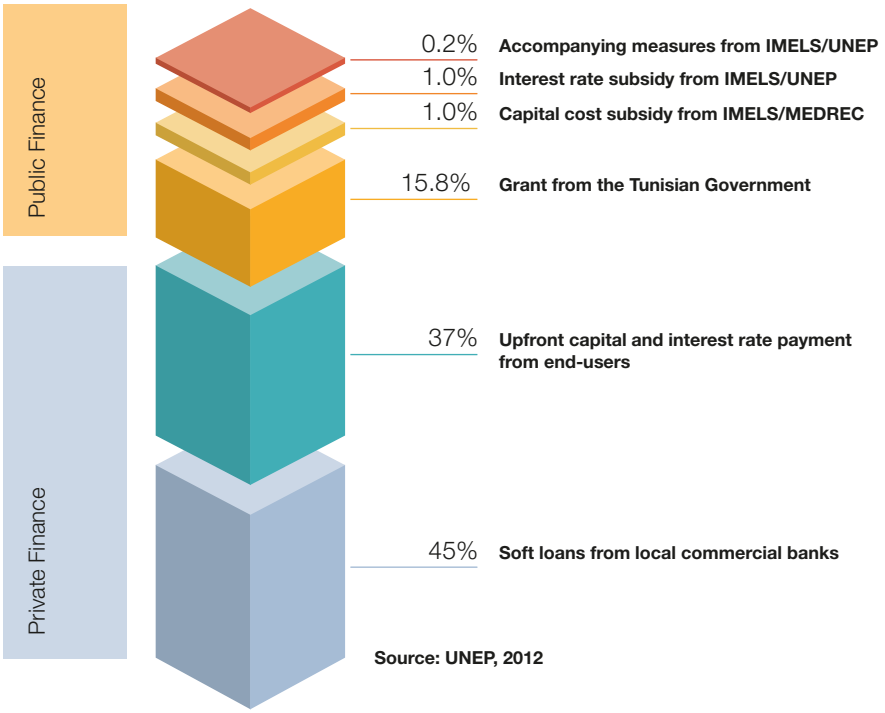
In the case of the PROSOL project, the innovative aspect lies in its efforts to actively involve all sector stakeholders, particularly the finance sector. The specific aims were to identify new lending opportunities with the aid of targeted capacity-building, and thus domestic banks started building dedicated loan portfolios. The main features of the PROSOL financing scheme were:

- The provision of loans by commercial banks to residential consumers (via accredited system suppliers), covering about 70% of SWH system costs, which were repaid through the electricity bill. Monthly loan repayments were structured to match current monthly spending on other forms of energy.
- The commercial banks involved agreed to it's wrong. The interest rate subsidy was funded by UNEP. The commercial banks have nevertheless accepted to lower their interest rate: the Initial average bank consumer loans interest rate is about 12% – 13%. With STEG's involvement in collecting repayment through electricity bills, banks lowered the interest rates by 5-6 points because the risk of non-payment is practically zero and extended consumer loan with five-year maturity, based on a guarantee by STEG.
- A 20% capital cost subsidy, funded by the Italian government, for 200-litre and 300-litre systems up to TND 100 (USD 71.9) per square meter (m^2) of collector surface.
- Consumer eligibility for PROSOL was linked to having an existing electricity supply contract with STEG, which was authorized to cut electricity provision in case of non-payment, which in turn led to low levels of payment default. This utility-based billing helped reduce the loan default risk perceived by banks, which accepted lower-than-commercial loan repayment rates for residential SWH system owners.

Due to the above-listed actions, end-users only paid a small part (approximately 10%) of the SWH system costs. SWH suppliers, on the other hand, were exposed to high debt levels, as they were the banks' intermediaries and passed on the financial support to their residential customers, the final beneficiaries of PROSOL.

The cost of the two-year program amounted to USD 2.4 million funded by the Italian government, with USD 1.2 million used by UNEP for the interest rate subsidies and public awareness campaigns and USD 1.2 million by ANME for the capital cost subsidies. An independent third party audited the program in early 2007, which ensured transparent monitoring.

Sources of financing of SWH systems in Tunisia



Source: UNEP, 2012

Activity		Cost covered by the government	Cost for which international assistance is required	Costs covered by private entities
Activity 1	Adapt the eligibility conditions to promote access of CES facilities of less than 1 kWp to financial incentives			
Activity 2	Include CES and PV systems in the technologies required in the specifications of the construction of public housing programs			
Activity 3	Improve the training of CES and PV installers			
	Update the training program		100%	
	Training of 500 solar PV installers			100%
	Training of 500 CES installers			100%
Activity 4	Build management, control and organizatinal capacities of the NAMA			
	Strengthen the information management system of the AMNE	25%	75%	
	Develop the control and verification procedures of the data quality	25%	75%	
	Build the human capacity of the NAMA	100%		
	Maintain and increase the frequency of the STEG studies	50%	50%	
Activity 5	Implement favorable conditions to lower the prizes of solar technologies			
	Gross annual salary of technical expert (3 years)		67%	33%
	Gross annual salary of technical expert assistant (3 years)		50%	50%
	Legal counseling (40 man-days)		60%	60%
Activity 6	Develop a study identifying the conditions of success and management tools to promote the access of public buildings and social housing to CES and solar PV	25%	75%	
Activity 7	Pilot projects to test the management tools for solar water heaters and PV systems in public buildings	8%	92%	
Activity 8	Creation of financial mechanism for solar water heaters and PV systems			
Activity 9	Design and implement an appropriate communication plan	70%	30%	
Total		**30%**	**50%**	**20%**

Source: Alcor, Ecofys 2013

6. Conclusion

Reducing consumption of LPG, electricity or other sources of energy by changing to SWH is a simple and cost-effective way for many countries to mitigate greenhouse gas emissions. This Guidebook describes how to articulate and seek support for a SWH strategy via a NAMA. Using the currently available guidance and templates for the structuring of the SWH NAMA ensures a systematic approach to implementation that is recognizable and potentially attractive to domestic and international financiers.

While this Guidebook concentrates on the elements that must be developed for a SWH NAMA, those countries that have already used the TechScope tool or even developed a national SWH strategy will have completed most of the work for a NAMA. The two main topics to add to the content of a national SWH strategy are the NAMA measuring, reporting and verifying scheme, and the financing plan and budget.

In many cases the economic analyses show SWH strategies to profitable in a life-cycle calculation. The financing approach could thus be straightforward through savings in other forms of energy consumption. However, SWH strategies may face a traditional investment barrier for 'high investment/low consumption' equipment. Therefore, additional third-party financing is still valuable if an attractive revenue model can be applied. An advantage of SWH NAMAs is that they can quickly become self-sustaining, thus creating the first NAMA implementation success stories with a credible exit strategy for the support.

The building blocks presented in this Guidebook are options that could be included in a tailor-made measuring, reporting and verifying system that should be guided by sensible considerations as to what is needed for a systematic and reasonably precise estimate of the emissions reduction impact of the strategy implementation. Although there may be different requirements for national versus international schemes, rigour should be applied to both because they require the same data to be collected. The international, third-party verification improves the trustworthiness of the results achieved. Designing for an international measurement, reporting and verification system and process from the outset reduces risk and encourages international financiers to engage with the NAMA host.

The relative ease with which a national SWH strategy can be carried through to the development of a NAMA also makes it an excellent introduction to NAMAs in general. Eventually most developing countries will have a suite of NAMAs in different sectors, with different modalities for implementation, financing, and measurement, reporting and verification. Some of these NAMAs can be mutually supporting. The development of a SWH NAMA gives countries an initial experience that can be applied to the development of NAMAs in other sectors. It provides a learning platform that should be actively promoted domestically, in public administration, in private businesses and in public in order to create awareness of the renewable energy, energy efficiency and emissions reduction agendas.

UNEP has promoted SWH agenda through the PROSOL project and the development of the GSWH project, and it is extending its support to countries developing SWH NAMAs. UNEP invites national and international financiers in both the public and private sectors to consider engaging in a global transition to SWH through NAMAs.

References

GTZ (2009) *Solar Thermal Application in Egypt, Jordan, Lebanon, Palestinian Territories, Syria and Tunisia: Technical Aspects, Framework Conditions and Private Sector Needs.* Cairo 23th-25th March 2009, Workshop Report, Eschborn.

Hack, S. (2006) *International Experiences with the Promotion of Solar Water Heaters (SWH) at Household-level*, report commissioned by GTZ's 'Environmental Protection and Resource Management' Programme Renewable Energy Promotion component, Mexico City.

International Energy Agency (IEA) (2010) *Energy Technology Perspectives 2010*. OECD/IEA, Paris.

Lütken, Søren E., *Financial Engineering of Climate Investments in Developing Countries: Nationally Appropriate Mitigation Action and how to finance it*. Anthem Press 2014.

Menichetti, E., Touhami, M. (2007). *Creating a credit market for solar thermal: the PROSOL project in Tunisia*. Paper presented at the ESTEC 2007 conference, United Nations Environment Programme, Paris.

Ölz, S. (2011) Fostering solar water heating: policy experiences and lessons from South Africa and Tunisia, in Haselip, J. et al. (2011) *Diffusion of renewable energy technologies: case studies of enabling frameworks in developing countries.* Technology Transfer Perspectives Series, UNEP-Risø Centre, Denmark, pp. 1-172

REN21 (2013). *MENA Renewables Status Report*
www.ren21.net/Portals/0/documents/activities/Regional%20Reports/MENA_2013_lowres.pdf (accessed 10 March 2014).

Trabacchi, C., Micale, V. and Frisari, G. (2012) *San Giorgio Group Case Study: PROSOL Tunisia*. Climate Policy Initiative. http://climatepolicyinitiative.org/wp-content/uploads/2012/08/PROSOL-Tunisia-SGG-Case-Study.pdf

UNDP/UNEP/UNFCCC (2013) *Guidance for NAMA Design: Building on Country Experiences*.

UNEP (2014a) *Solar Water Heating TechScope Market Readiness Assessment.* DTIE, Paris.

UNEP (2014b) Mediterranean Investment Facility UNEP, and Italian Ministry for the Environment, Land and Sea, *Partnership: building on success stories and partnerships*, DTIE, Paris.

UNEP (2013) *Guidebook for the Development of a Nationally Appropriate Mitigation Action on Efficient Lighting*, DTIE, Paris.

Weiss, W., Mauthner, F. (2012). Solar Heat Worldwide: 2011 Edition: Markets and Contribution to the Energy Supply 2009, IEA Solar Heating and Cooling (SHC) Implementing Agreement.

Wuppertal Institute (2010). *Policies for Energy Efficiency and Renewable Energy in the RCREEE Group of Countries*, report prepared for the Regional Center for Renewable Energy and Energy Efficiency (RCREEE) from the project 'Provision of Technical Support/Services for an Economical, Technological and Environmental Impact Assessment of National Regulations and Incentives for Renewable Energy and Energy Efficiency'
http://wupperinst.org/en/projects/details/wi/p/s/pd/241/ (accessed 10 March 2014).

Annex A:
The NAMA Registry: implementation support

Until the NAMA Registry is available online, details of submitting information to the prototype, via email, can be accessed at: http://unfccc.int/cooperation_support/nama/items/7512.php

Templates for email submissions are available upon request from: NAMA-registry@unfccc.int

The UNFCCC states that these templates can only be submitted via the relevant National Focal Point.

As of 13 August 2013, the UNFCCC offers a 55-page downloadable pdf, Manual of the NAMA Registry prototype, Version of 30 April 2013, at: http://unfccc.int/files/cooperation_support/nama/application/pdf/manual_for_prototype_version_of_30_april_release.pdf

This manual explains how to fill in the required information. It also provides flow charts for the processes of submitting, revising and updating NAMAs.

Annex B:

Some existing programmes for NAMA readiness activities

Lead organizations	Initiative	Sources of financial support
Energy Research Centre of the Netherlands (ECN) Ecofys	Mitigation Momentum[a]	German Ministry of the Environment
Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ)	International Partnership on Mitigation and Measuring, Reporting and Verifying[b]	German Ministry of the Environment
Center for Clean Air Policy (CCAP)	Mitigation Action Implementation Network[c]	German Ministry of the Environment; The Netherlands; and, Environment Canada, with additional support from the World Bank Institute's Carbon Finance-Assist programme and other donors
Japan International Cooperation Agency (JICA)	Training and Dialogue Programs on Capacity Development for NAMA/ MRV[d]	Ministry of Foreign Affairs, Japan
Global Environment Facility (GEF)	GEF Climate Change Priority	GEF
United Nations Development Programme	Low Emission Capacity Building Programme[e]	Australia; European Commission; and, German Ministry of the Environment
United Nations Environment Programme	en.lighten initiative	Australian Agency for International Development; and, GEF
United Nations Environment Programme	Facilitating Implementation and Readiness for Mitigation[f]	Denmark

[a] http://www.mitigationmomentum.org/

[b] http://www.bmu-klimaschutzinitiative.de/en/projects?p=1&d=840

[c] http://ccap.org/programs/mitigation-action-implementation-network-main/

[d] http://www.jica.go.jp/english/our_work/types_of_assistance/tech/acceptance/training/about/lineup.htmlhttp://www.jica.go.jp/english/our_work/types_of_ assistance/tech/acceptance/training/about/c8h0vm000066m3ps-att/environmental2013.pdf

[e] http://lowemissiondevelopment.org/

[f] http://www.lowcarbondev-support.org/

Annex C:
NAMA template for solar water heating / Questionaire for policy-makers

SECTION 1: NAMA Overview

Basic information

<table>
<tr><td colspan="2">1.1.1. Title of NAMA:</td></tr>
<tr><td colspan="2">1.1.2. Country:</td></tr>
<tr><td>1.1.4. Applicant (name, contact details, legal status)
Name of the person(s)/organisation responsible for the analysis and identification of measures for the NAMA proposal. If a working group is responsible, please name the members of the working group.</td><td>1.1.5. The Applicant's interest in the NAMA development and implementation
any economic, political or personal interest in any aspect of the NAMA</td></tr>
<tr><td>1.1.6. Sector/Subsector:
Sector/subsector in which NAMA takes place</td><td>1.1.7. Targeted Greenhouse Gas (tick):
<table><tr><td>CO_2</td><td></td><td>CH_4</td><td></td></tr><tr><td>N_2O</td><td></td><td>HFCs</td><td></td></tr><tr><td>PFCs</td><td></td><td>SF_6</td><td></td></tr><tr><td>NF_3</td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td colspan="2">1.1.8. Private-sector interest in the development of the NAMA:
Current private-sector involvement in the sector and the opportunities created by the NAMA for increased involvement</td></tr>
<tr><td>1.1.9. The appropriate public authority under whose auspices the NAMA would be implemented:
Entity/ies in charge of regulating the sector in which the NAMA is proposed</td><td>1.1.10. National NAMA Approver:[27]
Mention name of national NAMA Approver if one has already been designated in your country (if not, leave blank)</td></tr>
<tr><td colspan="2">1.1.11. Status of Endorsement by appropriate National Authority:
Endorsement is not required at the time of application, but formal endorsement must be provided before the application can be approved for funding</td></tr>
</table>

[27] The NAMA Approval authority is the designated national focal point or entity for submitting NAMAs to the UNFCCC NAMA Registry.

Overview of the key aspects of the NAMA

The table below presents a summary of the information described in SECTION 2.

1.2.1 Brief description of the objectives of the proposed NAMA and summary of measures to be included in the NAMA	*Describe the purpose of the NAMA by describing the current situation and the situation after NAMA implementation. Refer to technologies which would be implemented under the NAMA. Describe the objectives of the proposed NAMA in a clear manner.* *Briefly describe the measures that will be implemented as part of the NAMA.* *Explain what sources of emissions will be addressed by the proposed NAMA and how the proposed measures in the NAMA will impact GHG emissions. Refer to the GHG NAMA boundary.*
1.2.2 Relevance to the national sustainable development plan(s) or national strategies and/or to the sectoral mitigation goals	*Explain why the NAMA is relevant for national development plan/strategies and sectoral plans/strategies. In doing so, please provide information on the following:* *Describe the national sustainable development context and objectives.* *Refer to relevant existing national sustainable development plan/strategies.* *Describe the sectoral context (sector in which NAMA would be implemented) by referring to relevant existing sectoral plan/strategies.* *Describe sectoral mitigation goals, if any.* *Explain how the NAMA contributes to attaining the national sustainable development objectives and sectoral mitigation goals.*
1.2.3 Brief description of relevant existing mitigation initiatives and their synergies with the proposed NAMA	*Describe briefly any national and international (with international support) mitigation initiatives under implementation in the country that are relevant to the NAMA.* *For each of them, explain what are the links and synergies between the initiative and the NAMA. For each of them explain how coordination will be ensured with the NAMA.*
1.2.4 Brief description of the transformational impact, including its sustainability	*Provide a summary of the information detailed in point 5.5.*

SECTION 2: NAMA DETAILS

Introduction	
2.1.1 Description of the general context of the country, including overview of national development and climate change policies	*(2 pages)* *Describe the general social, economic and environmental context of the country relevant for the NAMA.* *Describe the national development strategies and list the national priorities and objectives relevant for the NAMA.* *Describe the national context related to climate change, and in particular the mitigation aspects.* *Describe briefly total national GHG emissions and key sources of emissions. Also describe available information on projections of national GHG emissions and key areas where growth is expected.* *Describe briefly the existing national climate change (mitigation) policies/ strategies/plans and specify the national emissions reductions objectives.* *Describe briefly the national institutional context existing in the country to manage the climate change issue, in particular for GHG mitigation.* *The information should provide references to key national development planning or strategy documents.*
2.1.2 Detailed description of the current situation in the sector/sub-sector, including the relevant existing legal, regulatory and institutional framework, in which the NAMA would be implemented	*(2-3 pages)* *Describe the contribution and importance of the sector (in which the NAMA would be implemented) in the country to national economic growth, and also its contributions to social (human development) and the environment, highlighting how this sector is related to national development priorities, and the objectives and challenges mentioned in 3.1.* *Explain the strategy and plans for development of the sector in which the NAMA would be implemented, as well as key objectives for the sector. Refer to national and/or any sector-specific strategy/development plans.* *Describe the GHG emissions for the sector in which the NAMA would be implemented and key sources of GHG emissions. Further, provide an assessment of projected growth in GHG emissions. Present any national/ sectoral strategy or approaches to addressing GHG emissions from the sector if available.* *Describe the current legal/policy framework, the existing institutional framework and the existing regulatory framework, as well any policies directly or indirectly relevant for GHG emissions.*

2.1.3. Description of scope and objectives of NAMA to address the current situation	*(1-2 pages)* *Starting from the current situation described in 2.1.2, describe in detail the general and specific objectives of the NAMA, including the main source of GHG emissions that would be reduced.* *Describe the scope of the NAMA by describing where in the country the NAMA will be implemented (national, sectoral, local level) and quantify the approximate emissions reductions from the NAMA (national, sectoral, local level).* *Describe how the NAMA relates to the existing legal/policy/regulatory framework and the existing institutional framework.*
Identification of barriers and implementation options	
2.2.1 Known barriers (financial, legal, regulatory, institutional, capacity, technology, etc.) that may impede achievement of the NAMA objectives	*(1-2 pages)* *Explain the barriers that may impede the achievement of the NAMA objectives. For instance:* *Economic and financial* *Market failures* *Policy and legal* *Regulatory* *Institutional and organisational capacity* *Human capacity* *Social and cultural*
2.2.2 Identification of possible options to address the barriers	*(1 page)* *Describe the proposed solutions (measures) to remove the barriers through the NAMA. For each solution (measure), describe the expected output from implementing the measure.* *Note that since the financial barriers are normally one of the main barriers, describing the solution through a financial analysis (although basic) with a comparison of costs (compared to other classic solutions that might be implemented in place of the NAMA) may be useful. For example, if it is proposed to develop a 'green mortgage program' with extended credit to low-income households, it should be explained how this would work, at which rate, etc.*
Description of the NAMA Action Plan	
2.3.1 Description of detailed activities to implement the mitigation measures included in the NAMA	*(2 pages)* *Based on the measures identified in 2.3.2, describe the key output that will be achieved for each measure. Describe in detail the key activities to be implemented to achieve the respective output for each of the identified measures.* *Describe how the outputs will contribute to the NAMA objectives beyond the limits of the mitigation measures, and how these objectives will promote the desired impacts.*

2.3.2 Implementation arrangements: roles and responsibilities of different entities and stakeholders involved in implementation of the NAMA, including institutional arrangements	*(2 pages)* *Describe the role of the private sector in the NAMA* *Describe the actors in the implementation of NAMA. Describe their role and their responsibilities.*
Estimate of National Sustainable Development Benefits and GHG impacts	
2.4.1 Baseline scenario: narrative description of baseline situation in absence of planned NAMA measures	*(1-2 pages)* *Describe the scenario that would occur in the absence of the NAMA. The baseline section should cover the following information:* *Description of existing situation in the sector/sub-sector in which the NAMA is being implemented.* *Provide information on the key parameters influencing the GHG emission sources that are to be addressed by the NAMA. Provide projections of these key parameters. For example, if the NAMA is to implement solar home systems, the emissions are from the use of energy for electricity. The section should provide information on the scenario for population change, the sources of electricity, the level of growth in electricity availability etc.* *If there are current mitigation policies in place, describe the impact of the implementation of these policies on the GHG emission sources related to the NAMA.*
2.4.2 NAMA scenario: narrative description of situation with the implementation of NAMA measures	*(1-2 pages)* *Describe the scenario that would occur with the implementation of the NAMA. Describe, based on the activities identified above in section 2.5.1, how NAMA implementation will influence the key parameters identified in section 6.1.*
2.4.3 Description of the benefits in terms of development (social, economic, and environmental)	*(1 page)* *Describe the development benefits obtained from NAMA implementation:* *Social benefits: human benefits (health, education, etc.)* *Economic benefits: jobs created, any costs reduced, national economic benefits, etc.* *Environmental benefits (other than GHG reductions): positive impacts on forests, land degradation, biodiversity protection, any other natural resources, reducing pollution, etc.*

2.4.4 Estimate of GHG emission reductions resulting from the implementation of NAMA measures, including description of methodology to estimate GHG emissions impact	*(2 pages)* *Calculate/estimate the GHG emissions related to the baseline scenario. Explain how the calculation/estimate has been made by explaining the methodology used, the hypothesis made, the formula used, etc.* *Calculate/estimate the GHG emissions related to the NAMA scenario. Explain how the calculation/estimate has been made by explaining the methodology used, the hypothesis made, the formula used, etc.* *Calculate the potential of GHG emissions reductions by comparing the baseline and the NAMA scenario.* *The information should be quantitative and should be linked to the description of the baseline and NAMA scenarios in the sections above.*
2.4.5 Description of the transformational impact of the NAMA, including its sustainability	*(1 page)* *Describe how the planned measures will have a long-term impact on the way different stakeholders make choices, and particularly how NAMA implementation will change the private sector's choice of lower emission alternatives.* *Describe how the NAMA will influence permanent policies for low emission development.* *Explain how the measures suggested in the NAMA will be sustained beyond the implementation of the NAMA. For example, if funding is requested for a standard setting and testing lab, how will the activities of this lab continue beyond NAMA implementation?* *Focus on operation rather than investment.*
Financial resources	
2.5.1 Current public operational and investment budget in the sector	*(1 page)* *Describe the operational cost and investment items in the targeted sector and give an estimate of the current public budget for these financial flows. Describe how the estimate is made and what assumptions are being used. Describe the current private investments in the sector and give an estimate of the size of these investments. Describe how the assessment is made. These assessments are challenging and may come with significant uncertainties. Please make sure that the numbers refer to the level at which the NAMA is suggested. For instance, if the NAMA is suggested for a municipal intervention, cost estimates should be at the same administrative level.*

<table>
<tr><td>2.5.2 Funding from domestic sources (public, private, investments, etc.)</td><td>(1 page)
Describe the expected financial participation by different financing entities listed in the table

<table><tr><th>Entity</th><th>annual operational budget</th><th>investment</th></tr><tr><td>government</td><td></td><td></td></tr><tr><td>municipality</td><td></td><td></td></tr><tr><td>local private investor</td><td></td><td></td></tr><tr><td>foreign private investor</td><td></td><td></td></tr><tr><td>local bank loan</td><td></td><td></td></tr><tr><td>development bank loan</td><td></td><td></td></tr><tr><td>guarantees</td><td></td><td></td></tr><tr><td>donor grants</td><td></td><td></td></tr></table>
Reference is made to the implementation and operation of the NAMA, not the cost of developing the NAMA, which is what the grant through the ADMIRE programme is for.

In the NAMA, while assessing domestic financial contributions, it should be kept in mind that, in the absence of the NAMA, the government would have implemented other measures (related to the baseline scenario) to achieve the national sustainable development objectives using domestic financial resources. See point 2.6.1 above. Also, investments would have been made in the baseline scenario either by the private sector or through loans from domestic financial institutions.</td></tr>
<tr><td>2.5.3 Risks affiliated with investments under the NAMA</td><td>(1 page)
Describe the risks that may threaten cash flows and delay or hinder investments for the implementation and successful operation of the NAMA.</td></tr>
<tr><td colspan="2">Measuring, Reporting and Verification</td></tr>
<tr><td>2.6.1 Description of key parameters to assess progress in NAMA implementation</td><td>Define the parameters/indicators that may be used to measure the progress of the NAMA implementation. Indicators should be identified for each of the outputs of the NAMA.
Indicators can be by proxy, e.g. number of solar water heaters sold, etc. In the case of qualitative parameters, define the qualitative scale that will be used.</td></tr>
<tr><td>2.6.2 Current data collection in the targeted sector</td><td>Describe how data for the different parameters are currently collected and who is involved in this process. If data are currently not collected, suggest procedures and responsible entities for collecting and compiling data to assess the efficiency of the NAMA. Suggest a frequency for measurement.</td></tr>
</table>

Non-financial support required	
2.7.1 Description of technical and the capacity-building needs	*(1 page)* *Describe in detail the technical support needed from the ADMIRE programme. This section should provide information on the nature and scope of the technical assistance that will bring the NAMA from proposal to implementation. Suggest roles for the ADMIRE team and show how they will complement the efforts made by the applicant.* *This section implicitly describes the applicants' understanding of the development process, the likely obstacles and barriers to the development and how these may be addressed. Please also provide a paragraph on how this enables capacity development in the country to sustain the change beyond NAMA implementation. This will be connected to the barriers identified in earlier sections.*
2.7.2 Timeline	*(1 page)* *Give an estimated timeline for the development of the NAMA, listing major tasks and milestones.* *Identify at least 3 milestones for stop/go decisions on whether to continue the development of the NAMA or whether the chances of achieving the initial objectives have been eroded.*

Annex D:
Some NAMA funding organizations

Only few financing institutions have specifically identified NAMAs as an object for financing activities. A survey carried out in 2013 by UNEP DTU Partnership (then the UNEP Risoe Centre) only had the instsitutions and programmes listed below confirming that they were willing to consider involving themselves in the financing of NAMAs. However, as it is also indicated in this publication, the NAMA is an acronym which in its substance covers investments in a range of economic sectors which continues to attract financing from a multitude of financing institutions, although not specified as 'NAMA financing'.

International Climate Initiative (IKI)

- Sponsors/investors: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), Germany, and Energy and Climate Fund (EKF)
- Fund size: EUR 120 million (annually)
- Target: energy (and others) for national/sectoral goal, strategy, national/sectoral policy or programme
- Type of support: projects, such as developing NAMAs, gaining access to funding for implementation, and implementing ambitious components of NAMAs
- Accessible by: individual project developers
- Example of project finance: Mitigation Momentum NAMAs
- More information: http://www.international-climate-initiative.com/en/
- Contact: annual call for proposals: programmbuero@programmbuero-klima.de

The NAMA Facility

- Sponsors/investors: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), Germany, and Department of Energy and Climate Change (DECC), UK
- Fund size: EUR 70 million
- Target: NAMA support projects
- Type of support: NAMA support projects (grants)
- Accessible by: partner governments, individual project developers
- More information and templates: http://www.international-climate-initiative.com/en/issues/nama-facility/
- https://www.gov.uk/government/publications/information-about-the-nationally-appropriate-mitigation-actions-nama-facility
- Contact: contact@NAMA-Facility.org

Global Climate Partnership Fund (GCPF)

- Sponsors/investors: KfW Entwicklungsbank, International Finance Corporation (IFC), Ministry of Foreign Affairs, Denmark, and Deutsche Bank
- Fund size: USD 235 million
- Target: energy (efficiency and renewables) for emerging and developing countries
- Type of support: technical, financial (senior and mezzanine debt, limited equity)
- Accessible by: financial institutions, project developers, sponsors and technology providers
- More information: http://gcpf.lu/ and http://gcpf.lu/investment-portfolio-62.html
- Contact: info@gcpf.lu

Global Energy Efficiency and Renewable Energy Fund (GEEREF)

- Sponsors/investors: European Union, Germany, Norway, European Investment Bank Group (European Investment • Bank and the European Investment Fund)
- Fund size: EUR 112 million
- Target: energy (efficiency and renewables) for developing countries in Asia, Latin America and Africa
- Type of support: technical, financial (equity, channels financing to regional funds)
- Accessible by: regional funds, private equity funds
- More information: http://geeref.com/
- Contact: geeref@eib.org

The Green Climate Fund (anticipated opening in 2014)

- Sponsors/investors: (The World Bank is interim Trustee)
- Fund size: (anticipated, USD 100 billion)
- Target: mitigation, and adaptation to climate change in developing countries
- More information: http://gcfund.net/home.html
- Contact: Interim Secretariat, isecretariat@gcfund.net

KfW Development and Climate Finance

- Sponsor/investor: KfW, Germany
- Target: any
- Type of support: financial (grants, concessional loans, structured financing)
- Accessible by: national governments
- Contact: info@kfw-Entwicklungsbank.de

About the UNEP Division of Technology, Industry and Economics

Set up in 1975, three years after UNEP was created, the Division of Technology, Industry and Economics (DTIE) provides solutions to policy-makers and helps change the business environment by offering platforms for dialogue and co-operation, innovative policy options, pilot projects and creative market mechanisms.

DTIE plays a leading role in three of the six UNEP strategic priorities: climate change, harmful substances and hazardous waste, resource efficiency.

DTIE is also actively contributing to the Green Economy Initiative launched by UNEP in 2008. This aims to shift national and world economies on to a new path, in which jobs and output growth are driven by increased investment in green sectors, and by a switch of consumers' preferences towards environmentally friendly goods and services.

Moreover, DTIE is responsible for fulfilling UNEP's mandate as an implementing agency for the Montreal Protocol Multilateral Fund and plays an executing role for a number of UNEP projects financed by the Global Environment Facility.

The Office of the Director, located in Paris, coordinates activities through:

- **The International Environmental Technology Centre** – IETC (Osaka), which promotes the collection and dissemination of knowledge on Environmentally Sound Technologies with a focus on waste management. The broad objective is to enhance the understanding of converting waste into a resource and thus reduce impacts on human health and the environment.
- **Sustainable Consumption and Production** (Paris), which promotes sustainable consumption and production patterns as a contribution to human development through global markets.
- **Chemicals** (Geneva), which catalyses global actions to bring about the sound management of chemicals and the improvement of chemical safety worldwide.
- **Energy** (Paris and Nairobi), which fosters energy and transport policies for sustainable development and encourages investment in renewable energy and energy efficiency.
- **OzonAction** (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition to ensure implementation of the Montreal Protocol.
- **Economics and Trade** (Geneva), which helps countries to integrate environmental considerations into economic and trade policies, and works with the finance sector to incorporate sustainable development policies. This branch is also charged with producing green economy reports.

DTIE works with many partners (other UN agencies and programmes, international organizations, governments, non-governmental organizations, business, industry, the media and the public) to raise awareness, improve the transfer of knowledge and information, foster technological cooperation and implement international conventions and agreements.

For more information:
see **www.unep.org/dtie**

This Guidebook emphasizes the role of solar water heating and its potential for rapidly reducing carbon emissions and delivering economic and environmental benefits through Nationally Appropriate Mitigation Actions (NAMAs). It has been designed to assist governments, international agencies and other stakeholders shape national programmes and policies for solar water heating into NAMAs. The Guidebook addresses critical elements required to establish a successful solar water heating NAMA by providing the most up-to-date information and case studies related specifically to solar water heating.

Approaches and examples from the Solar Water Heating Technology Scope (SWH TechScope) Country Market Evaluation Toolkit, which was developed in the framework of UNEP's "Global Solar Water Heating Market Transformation and Strengthening Initiative" , has been incorporated into the guide. It helps establishing the basis for accelerating national market transformation towards a greater uptake of solar water heating.

For more information about the Global Solar Water Heating Market Transformation and Strengthening Initiative, please visit: http://solarthermalworld.org/content/solar-water-heating-techscope-market-readiness-assessment-2014

www.unep.org

United Nations Environment Programme
P.O. Box 30552 Nairobi, Kenya
Tel.: ++254-(0)20-762 1234
Fax: ++254-(0)20-762 3927
E-mail: uneppub@unep.org

UNEP

For more information, contact:
UNEP DTIE
Energy Branch
15 rue de Milan
75441 Paris CEDEX 09
France
Tel: +33 1 4437 1450
Fax: +33 1 4437 1474
E-mail:unep.tie@unep.org
www.unep.org/energy

ISBN: 978-87-93130-16-6