CAPACITY DEVELOPMENT NEEDS DIAGNOSTICS FOR RENEWABLE ENERGY – CADRE

Wind and solar energy

VOLUME I: THE HANDBOOK

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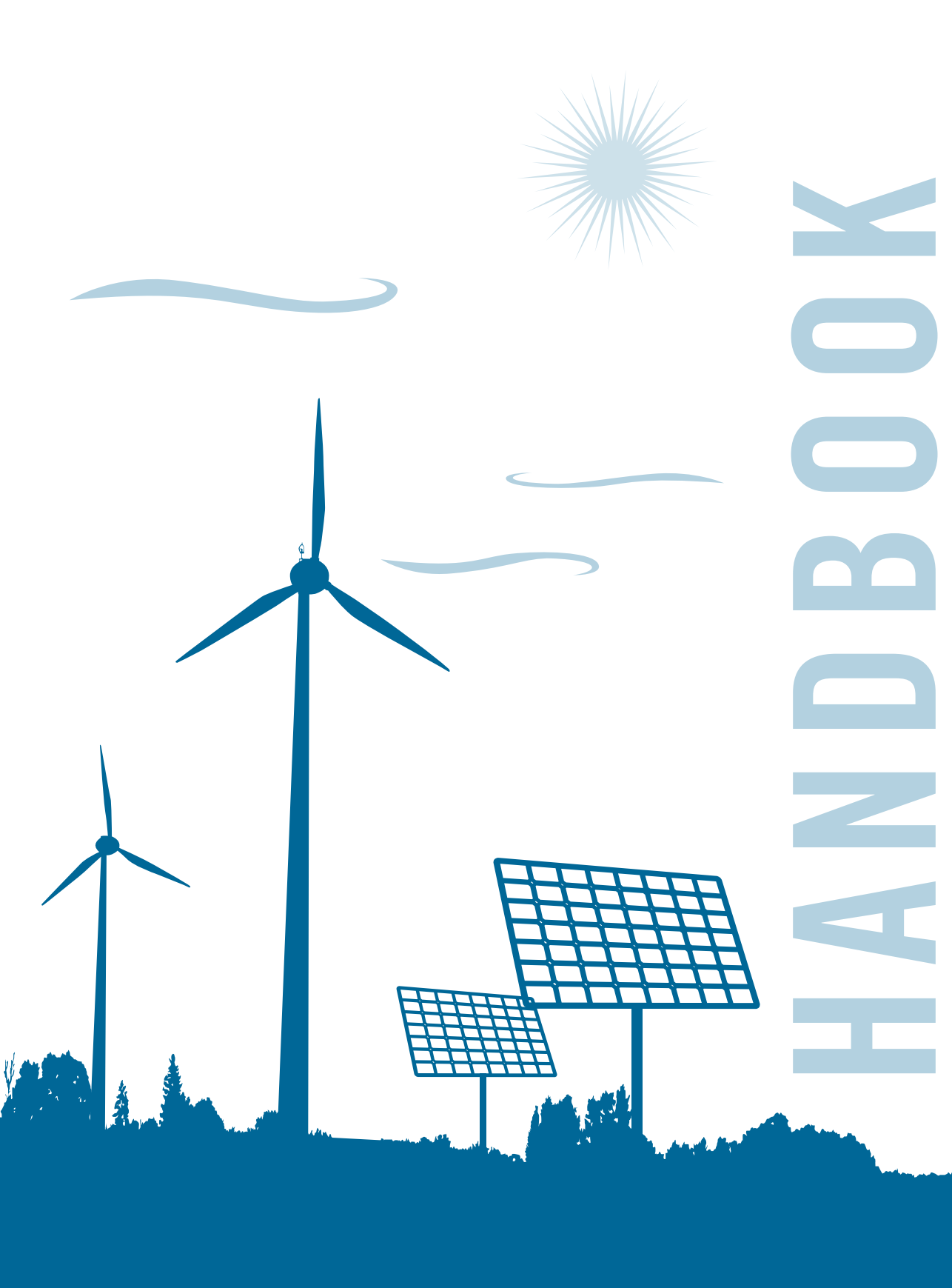
IDAE
Instituto para la Diversificación y Ahorro de la Energía

IRENA
International Renewable Energy Agency

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

HANDBOOK



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Lead coordinators
Mike Enskat and Joscha Rosenbusch (GIZ)

Lead contributors
Sofia Martínez Martínez (IDAE)
Hugo Lucas and Cornelia Marschel (IRENA)
Ron Benioff and Caroline Uriarte (NREL)

Forewords

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Over the last decade the wide scale deployment of renewable energy has become a priority issue for governments and policy makers in all industrialized economies, in most emerging markets and certainly in very many developing countries. However, moving from talk to action often turns out to be much more difficult than expected.

This transformation has implications and requires change at all levels of policy making, administration and economic management. A systematic understanding of the various capacities needed for such a transformation is essential in order to manage a smooth transition towards an energy system based on renewable resources. This is what has stimulated the thinking and work that resulted in this *Handbook and Toolbox for Practitioners on Capacity Needs Diagnostics for Renewable Energy.*

GIZ has been supporting many partner countries in their capacity development for the promotion of renewable energies for more than 30 years. It is a great honor to bring our methodological approaches and our practical experience to the table and to work with IDAE, IRENA and NREL as distinguished organizations in the field of energy to produce this *Handbook* and its *Toolbox* under the auspices of the *Clean Energy Ministerial's Multilateral Working Group on Solar and Wind Energy.*

Dr. Christoph Beier
Managing Director (GIZ)

Amongst all the components of the capacity building process for renewable energies, normally the capacity assessment is the least well developed or understood. Thus, it is very common that efforts are focused towards meeting capacity needs, without undertaking the required analysis to ensure that the solution is the most appropriate for the specific circumstances. The methodology presented in these guidelines and toolbox aims to provide a robust local/regional/national level evidence base for ultimately creating an enabling environment for solar and wind energy deployment in any particular location. CaDRE is a dynamic process, based on existing experiences and approaches, and is of great interest to IDAE. IDAE's activity is focused on those actions concerning energy saving, energy efficiency and the promotion of renewable energies in Spain. In addition, IDAE also has a strong focus on international activities and projects. Hence, CaDRE will become a tool for our related activities both domestically and internationally, providing a solid support to understand different situations and needs. CaDRE can be further used as the starting point in formulating future objectives and strategies for the solar and wind energy sector.

Fidel Perez Montes
Director General (IDAE)

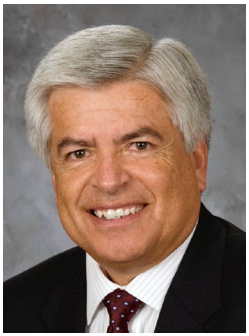
Renewable energy is a building block towards sustainable practices and economies, opening avenues, particularly for developing countries, for serving the needs of the poor and accelerating sustainable economic growth.

Meeting the needs of developing countries requires dramatic growth in the global energy sector. Renewable energy will play an essential role in improving the access of millions to modern energy services, mitigating economic risk by ensuring energy security, and contributing to reducing the risk of climate change by lowering emissions.

Although many countries may have a renewable energy target, policy or support mechanism, their deployment in developing countries remains limited to date. A lack of enabling frameworks and legislation, insufficient technical, business and administrative knowledge, and limited access to finance hinder the development of this sector. IRENA is positioned to promote renewable energy solutions. Capacity building is an essential part of this undertaking. To achieve our shared vision of greater deployment of renewable energy, it is critical to assist countries, particularly developing countries, to identify capacity assets, needs and gaps so as to provide governments with a solid basis for decision making and practical solutions to nurture renewable energy markets.

In 2010, under the auspices of the *Clean Energy Ministerial's Working Group on Solar and Wind Energy,* IRENA, the GIZ, IDAE and NREL joined hands to promote capacity needs assessments in the renewable energy sector. These guidelines present to the global community the result of this challenging task, and provide a tailored methodology to facilitate efficient implementation of assessments in the renewable energy sector. IRENA strives to encourage governments to conduct capacity needs assessments and to pursue a course towards a more sustainable and inclusive future.

Adnan Z. Amin
Director General (IRENA)



To advance renewable energy and energy efficiency solutions across the globe, NREL partners with multiple international organizations through collaborative R&D, analysis, and deployment projects. In support of these objectives, NREL has joined with IRENA, IDAE and GIZ to develop a *Handbook* and *Toolbox* for conducting renewable energy capacity needs assessments. This is an important partnership under the *Clean Energy Ministerial* that will accelerate renewable energy deployment around the world.

The *Handbook* and *Toolbox* provide a comprehensive reference source for policy makers, in-country practitioners, educational and technical institutions, and other stakeholders evaluating renewable energy capacity needs and designing capacity building programs.

NREL will use this practical guide to inform and support renewable energy projects that we conduct with countries in all regions of the world. It will assist NREL personnel in designing effective training and educational strategies and programs by providing a framework for capacity building assessment with lessons learned from the field. NREL will also share this *Handbook* and toolkit with partner international organizations and networks, such as those participating in the *Clean Energy Solutions Center*, the *Low Emission Development Strategies* (LEDS) *Global Partnership*, and the *Coordinated Low Emissions Assistance Network* (CLEAN).

Dan E. Arvizu
Director (NREL)

Acronyms

ADB	*Asian Development Bank*
BMU	*Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Germany)*
BOO(T)	*Build-Own-Operate-(Transfer)*
CaDRE	*Capacity Development Needs Diagnostics for Renewable Energy*
CDM	*Clean Development Mechanism*
CEM	*Clean Energy Ministerial*
ESPRO	*Energy Service Provider*
EU	*European Union*
GIS	*Geographical Information System*
GIZ	*Deutsche Gesellschaft für Internationale Zusammenarbeit, GmbH (Germany)*
GTZ	*Deutsche Gesellschaft für Technische Zusammenarbeit, GmbH (Germany)*
GW	*Gigawatt*
GWEC	*Global Wind Energy Council*
HRD	*Human Resource Development*
IDAE	*Instituto para la Diversificacion y Ahorro de la Energia (Spain)*
IRENA	*International Renewable Energy Agency*
LoI	*Letter of Intent*
MoU	*Memorandum of Understanding*
MWGSW	*Multilateral Working Group on Solar and Wind Energy Technologies*
NAMA	*Nationally Appropriate Mitigation Action*
NGOs	*Non-governmental Organisations*
NREL	*National Renewable Energy Laboratory - U.S. Department of Energy (DOE)*
O&M	*Operation and Maintenance*
PPP	*Public Private Partnership*
PSPP	*Pump Storage Power Plants*
PV	*Photovoltaic*
R&D	*Research and Development*
RE	*Renewable Energy*
RET	*Renewable Energy Technology*
SWOT	*Strengths, Weaknesses, Opportunities and Threats*
ToR	*Terms of Reference*
UNDP	*United Nations Development Programme*
WB	*World Bank*

Executive summary

Many governments across the world have set ambitious targets for the deployment of renewable energy. Integrating renewable energy technologies efficiently within established energy structures is a complex process which may require changes to policy, institutional and market mechanisms. This means the energy sector has to develop its national and local **capacity** in such a way that it can accommodate the specific needs of the newly introduced or planned systems.

Capacity building measures need to be based on a capacity development strategy and implementation plans that ensure the balanced and sustainable growth of the national and local renewable energy sector.

The *Capacity Development Needs Diagnostics for Renewable Energy* (CaDRE), introduced in this *Handbook*, helps policy makers, organisations and capacity development/renewable energy practitioners shape an environment conducive to the development of renewable energy.

CaDRE is designed as a country-driven, comprehensive approach to analysing the capacity already in place, predicting future capacity needs, identifying capacity gaps and providing recommendations for creating capacity development strategies. It is based on the guiding principle that no successful capacity development strategy can be built without intensive stakeholder engagement.

Its approach is based on the notion that the successful development of a renewable energy sector is only possible when the required capacities are present at each of the following four levels: the **system level**, which includes the enabling environment and framework conditions for renewable energy; the **organisational level**, which consists of institutions and organisations and their ability to effectively handle their mandate and adapt to change; the **individual level**, which takes into account the awareness, knowledge, technical and managerial skills of the people working in the sector and also considers the present and future development and trends of the renewable energy job market; and the **network level**, which includes a whole range of exchange, communication and negotiation platforms for stakeholders who share similar interests and/or occupations.

This *Handbook* and *Toolbox* provide modular guidelines and practical tools for planning and completing a comprehensive diagnostic of the energy landscape. They also supply the tools for conducting an analysis of capacity gaps related to solar and wind energy targets.

When existing capacities are compared to a target scenario, capacity gaps can be identified and recommendations made. The **Target Model for the wind and/or solar energy sector** helps to identify which modifications and new developments will be needed to achieve the set targets (capacity needs), the potential of the system already in place to cope with the new challenge (existing capacities) and the functions, structures, knowledge and skills that still need to be developed (capacity gaps).

The *Toolbox* complements the *Handbook*, providing **a compendium of practical tools** that facilitate the diagnostic process.

Although the *Handbook* and *Toolbox* focus on the capacity needs of the solar and wind energy sectors, many of the methods and tools described can be applied or adapted to other renewable energy technologies.

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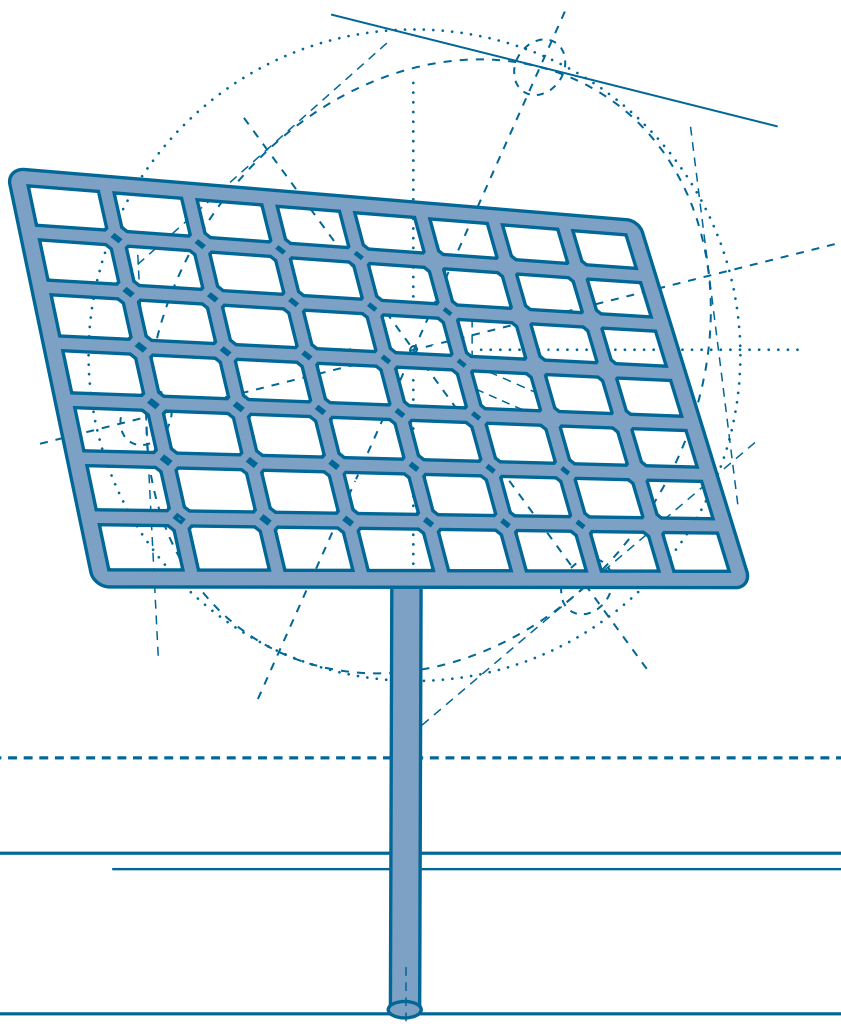
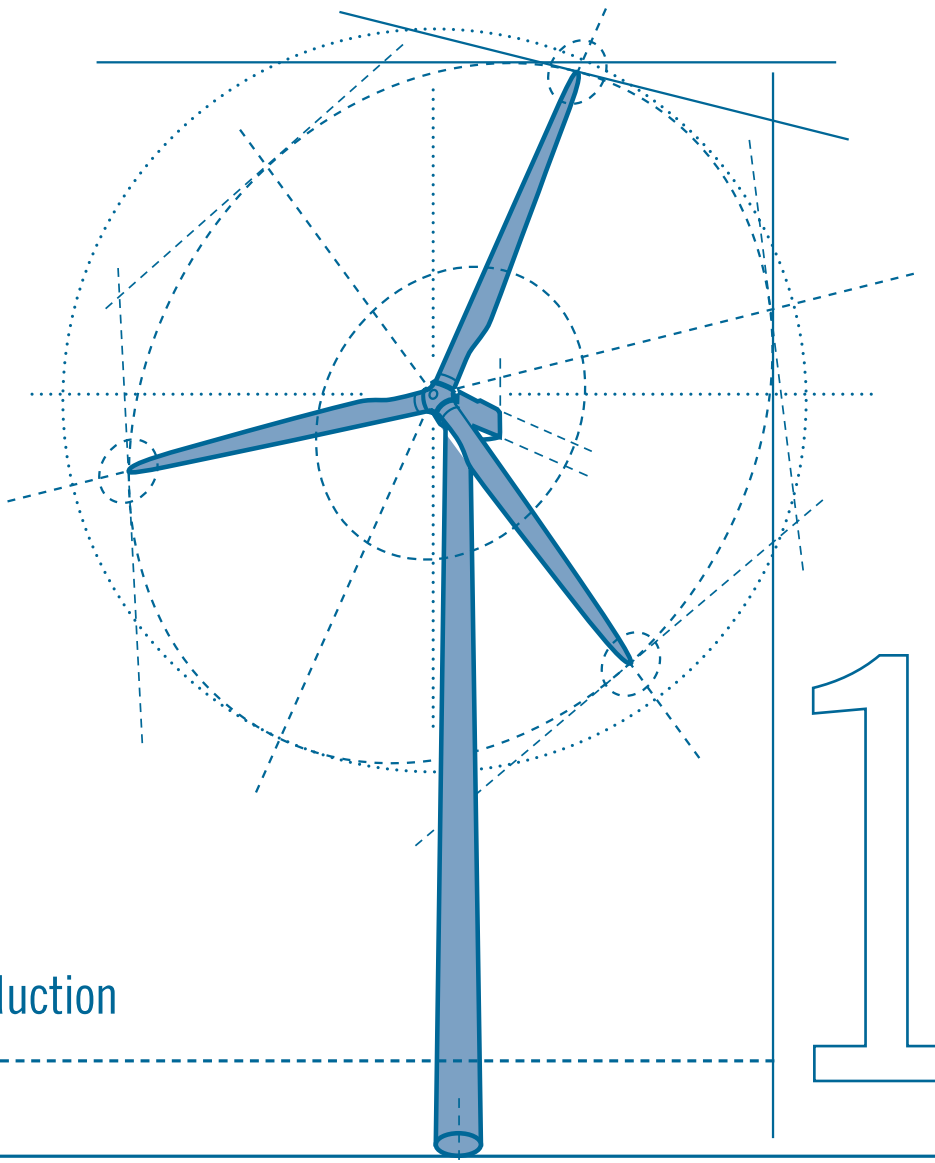




1

Introduction

The importance of capacity development to the renewable energy sector

Given the enormous cost reductions in recent years, the increased use of renewable energies has become a viable and desired option for many countries. Deploying renewable energy technologies is a climate friendly solution to meet the increasing demand for energy services and to bring forth the transition to a green economy.

Many governments worldwide have set ambitious targets for the deployment of renewable energy technologies. According to the *Renewables 2011, Global Status Report* (REN21 2011) at least 118 countries had some type of policy target or renewable energy support policy at the national level in 2011 (up from 55 countries in early 2005). This is reflected in growing rates of renewable energy installed capacity and consumption. In 2011, around 194 GW of new capacity was installed, half of which comes from renewable energy sources. Overall, renewable energy accounted for almost 20 % of global electricity supply.

Although global investment in renewable energy has obviously increased significantly in recent years, renewable energy markets still face a wide range of barriers to the large scale deployment needed to reach economic and environmental targets. Among the most common obstacles are:

- **inadequate or insufficient policies**, legal and regulatory frameworks: e.g. a lack of clear rules and incentives for feeding electricity from renewables into the grid
- **lack of institutional structures and capacities** dedicated to renewable energy, both in the public and the private sector: e.g. no special institution or department dedicated to promoting renewable energy deployment
- **administrative hurdles** and no clear guidelines for renewable energy: e.g. complicated land use regulations and no clear framework for required licences and permits
- **lack of awareness and confidence** among government and private sector stakeholders, in the potential of renewable energy technologies to deliver sustainable and bankable projects: e.g. financial institutions not being able to assess risks and opportunities in renewable energy investments
- **lack of professionals and technicians** skilled in renewable energy technologies, e.g. engineers for wind farm planning or electricians who can install and operate solar panels
- **lack of or limited resources** and/or infrastructure for the training and capacity building of individuals and institutions: e.g. a lack of graduate study in renewable energy or an absence of vocational training for technicians
- **lack of appropriate financing mechanisms and incentives:** e.g. incentives for research and development, feed-in tariffs, green certificate trading systems or other incentive models for renewable energy

- **lack of investment** in renewable power generation, local technology production, supply and maintenance
- **lack of integrated resource planning and inadequate integration of renewable energy sources** into existing energy systems.

The barriers outlined above often correlate to a lack of knowledge and experience with renewable energy and of capacities within the system. Many of these obstacles can be leapfrogged by targeted capacity development measures. These will lay the ground work for a new energy infrastructure.

Introducing new technologies and renewable energy solutions into established energy systems is a learning process which often requires changes to well established policy, institutional and market structures. This means the energy sector has to adapt and develop its capacity to accommodate the specific needs of the newly introduced or planned systems.

This process of adaptation (also known as **capacity development**) is usually characterised by the need to formulate favourable policies, adapt the legal setting and strengthen institutions. It is usually accompanied by a high demand for and supply shortage of the relevant specialist knowledge and skills. These challenges are especially intense in countries where renewable energy systems have not been introduced gradually, but as a rapid reaction to international climate change policy or to rising prices for non-renewable energy (ILO 2011). In particular, limited institutional and human capacities can constitute major development barriers during the early stages of renewable energy deployment. Capacity development measures help to provide the necessary political and institutional framework and facilitate and accelerate the deployment of renewable energy technologies.

Capacity can be defined as the extent to which a system, network, institution/organisation and/or individuals can accomplish their goals, perform their tasks, solve problems, innovate and make informed choices.

Capacity development is a holistic process through which people, organisations and societies mobilise, maintain, adapt and expand their ability to manage their own sustainable development. (GTZ 2010)

The renewable energy sector offers great employment potential. It creates new jobs and new qualifications at different stages of the technology value chain – such as renewable energy engineers and planners. It also affects traditional work processes in government institutions and supporting enterprises involved. Depending on local conditions, the net impact of expanded renewable energy deployment can have different macro employment impacts in different countries. The identification of future demand for new skills for solar and wind energy related products and services, and the resulting need for new educational and training supply, will play an important part in **the design of capacity building strategies**.

To be effective and efficient, capacity development measures have to be defined in the context of an individual country and their scope, content and intensity need to be suited to that particular country. The proper assessment of the existing and required capacities in a particular country can provide the different stakeholders in the renewable energy sector with the orientation needed to plan and implement such measures in a balanced way.

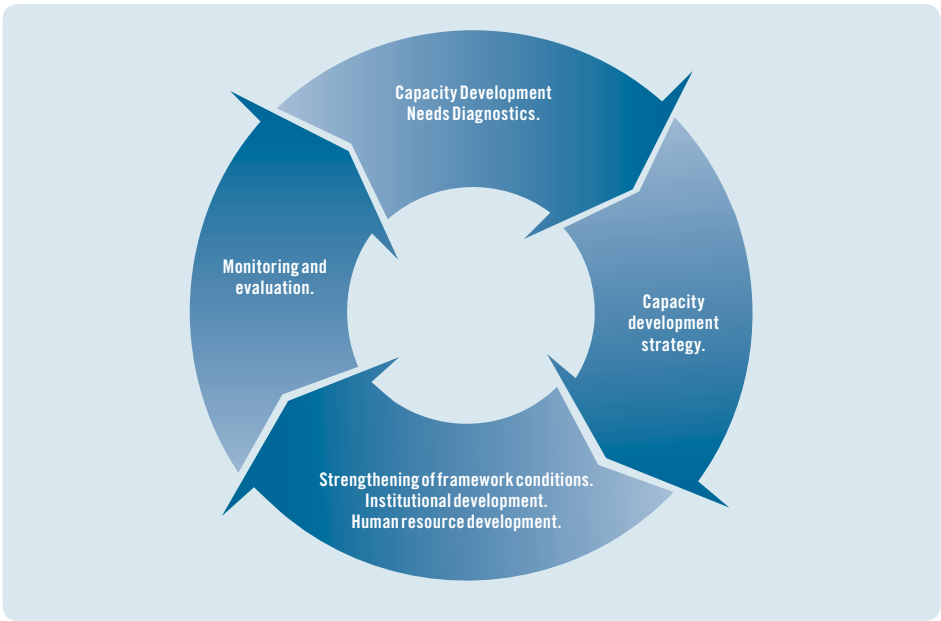
Phases of successful capacity development

Capacity Development Needs Diagnostics is understood as the comprehensive analysis of the difference between existing and required capacities (capacity gap) to create a basis for the demand-orientated planning and implementation of capacity development strategies.

The capacity development process can be described as a cycle with four major phases (*see Figure 1.1*). The rationale behind this cycle is that an effective, balanced and efficient strategy can only be developed if the specific capacity needs in the field of interest are thoroughly analysed. Once these are known, appropriate measures to satisfy the capacity needs at the systems, organisational and individual level can be designed and implemented. Continuous monitoring and evaluation of the results and impacts of these measures allows new measures to be taken in line with new developments. The phases are:

- **Phase I** – The *Capacity Development Needs Diagnostics* – provides the necessary information (baseline) for Phase II.
- **Phase II** – The design of a *capacity development strategy.*
- **Phase III** – The implementation of the strategy combines various issues, such as *the strengthening of framework conditions, institutional/organisational development and human resource development.*
- **Phase IV** – *The monitoring and evaluation process* provides the necessary input to continuously adapt the process to changing capacity development needs. It also helps to evaluate successes, failures and the impact of the capacity development measures.

Figure 1.1 Capacity development process



Scope and objectives of the CaDRE Handbook and Toolbox

The *Handbook and Toolbox for Capacity Development Needs Diagnostics for Renewable Energy (CaDRE)* focus on the first phase of the capacity development cycle. They provide a step-by-step guide to help practitioners plan and conduct comprehensive capacity needs diagnostics at a national, regional or local level.

Using these guidelines, practitioners can set a thorough and comprehensive baseline enabling policy makers and organisational leaders to make informed decisions concerning strategic capacity development. This baseline provides an in-depth picture of the capacities required to reach solar and wind energy goals. It also highlights existing strengths and brings to light capacity gaps. The *Handbook* provides:

1. A **description of the requirements** and necessary conditions for conducting a CaDRE.
2. Concrete, practical and user-oriented **guidelines** on how to conduct comprehensive capacity needs diagnostics (at the system, institutional, network and individual levels) and how to interpret and prioritise results to facilitate strategic decision making.
3. A modular design that allows **quick, partial or full diagnostics** depending on the desired scope and focus, budget or time availability.
4. An **overview and sequence of recommended tasks** to be completed throughout the diagnostic and decision making processes.
5. **Practical recommendations** and references to useful and proven tools which facilitate the diagnostic process.
6. **Experiences and lessons learnt** from previous capacity needs diagnostics and capacity development projects.
7. Suggestions on how to **integrate the results in the capacity development cycle**.

The *Toolbox* complements the *Handbook*, providing a **compendium of practical tools** that make the diagnostic process easier.
These guidelines outline a number of steps and tools that aim at facilitating the CaDRE process for practitioners. Nevertheless, they should not be seen as a rigid prescription but rather as a support to design a tailor-made CaDRE which adapts to the needs of the context analysed.

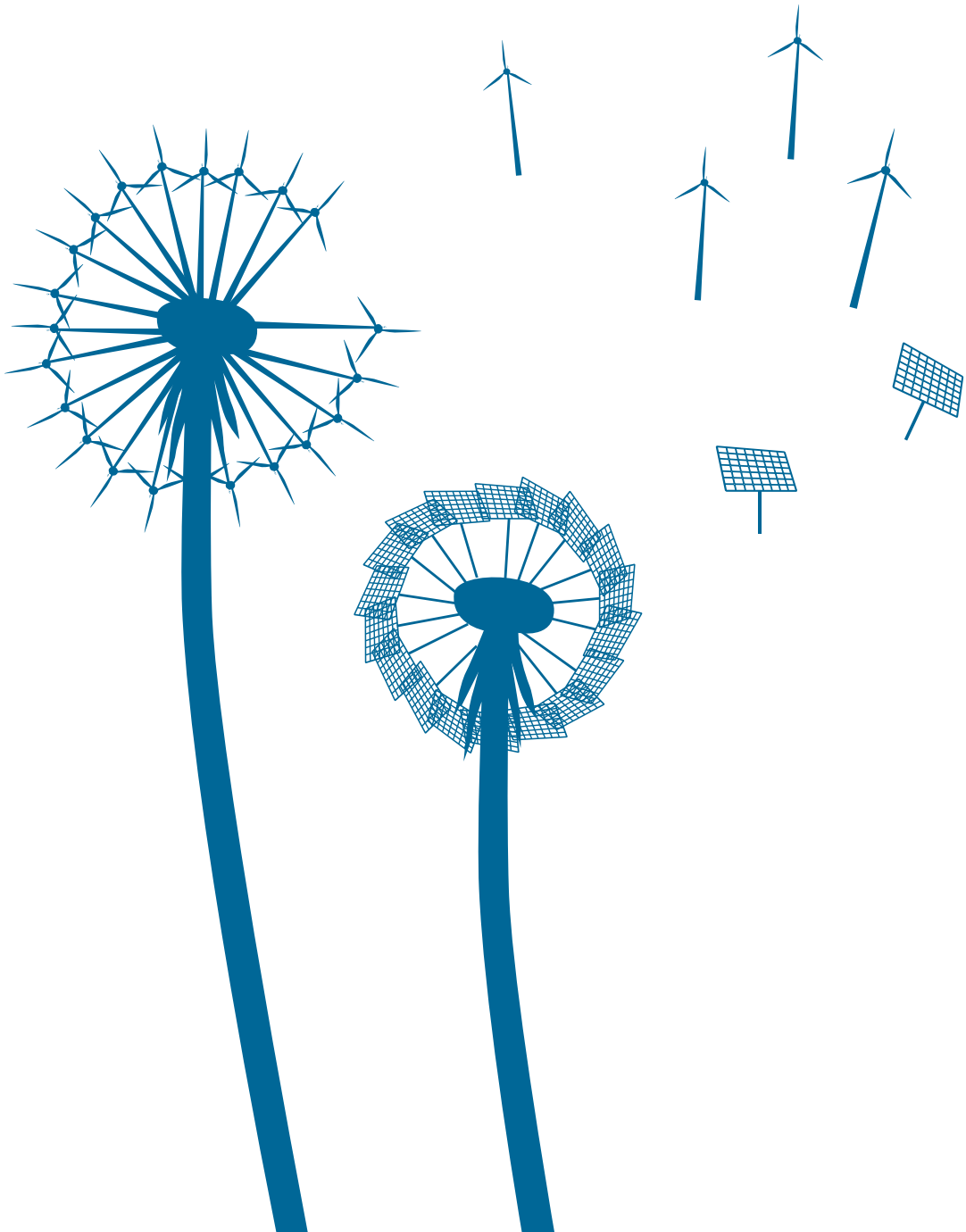
The *Handbook* and *Toolbox* focus on the capacity needs of the solar and wind energy sectors. Nevertheless, many of the methods and tools described can be applied or adapted to other types of renewable energy.

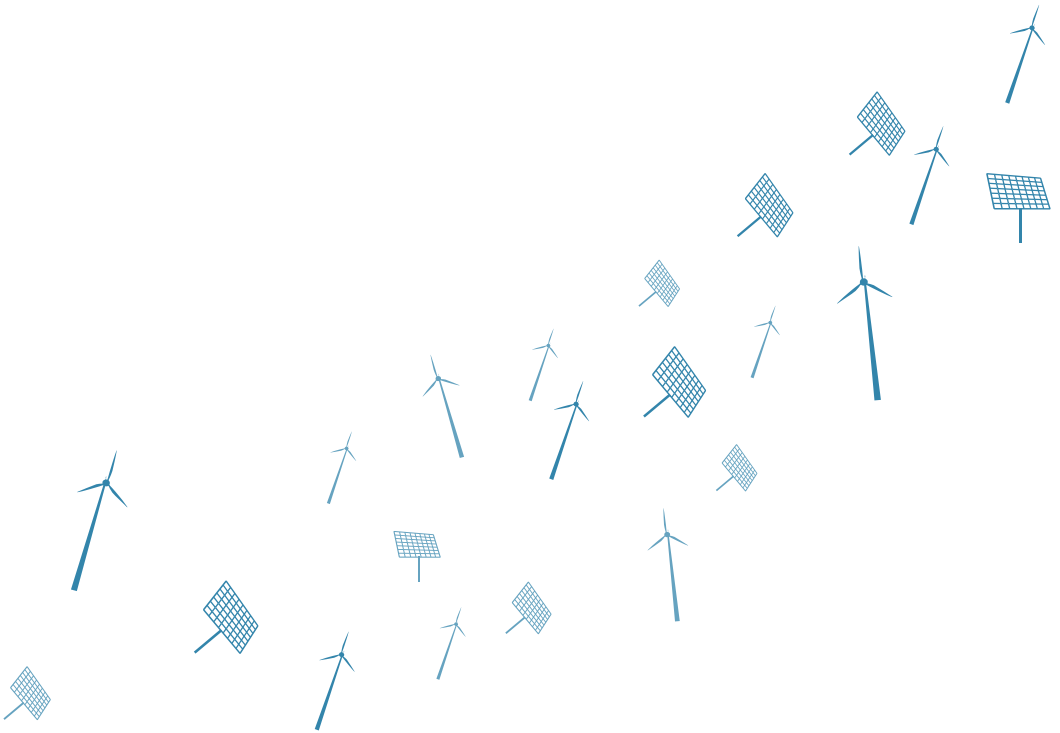
The formulation of capacity development strategies and the design of capacity development measures are outside of the scope of the *Handbook* and *Toolbox*. Nevertheless, general considerations for strategy development and best practices are provided in *Chapter 4*, *Chapter 5* and *Modules 3.1* and *3.2*.

Potential users of the CaDRE Handbook and Toolbox

The CaDRE *Handbook* and *Toolbox* are aimed at two main types of practitioners: technical staff and/or consultants in charge of planning and conducting the CaDRE, and decision makers who commission a CaDRE and will use the results either to design capacity development strategies or for other purposes. The following is a more detailed list of potential users and the possible uses CaDRE could have for them:

	**Staff, in-house and/or external professionals** in ministries, organisations and companies that facilitate the diagnostic and decision making processes.	Carry out the CaDRE and provide the basis and inputs for strategic decision making. This group would form the technical team for the project.
	**Policy makers (ministries)** responsible for climate change plans and renewable energy policies at the regional, national, provincial and local level.	Provide the basis and inputs for strategic decisions and energy investment; draw up plans and programmes; set guidelines and lay the foundations for favourable regulations for renewable energy; plan capacity development activities and coordinate the activities of international development partners.
	**National institutions** responsible for the development of the national renewable energy sector (e.g. renewable energy agencies, regulators).	Provide the basis and inputs for strategic decisions for designing capacity development strategies and give strategic orientation.
	**Educational and other technical or research institutions** (universities, training providers, laboratories).	Develop strategies and a framework for research, education and training improvement and development; invest in and devise the new curriculum.
	**Private companies** involved in renewable energy.	Invest in improving their products and services. Business strategy and in-house organisational and skill development.
	**Financial institutions** which fund renewable energy.	Make strategic decisions to invest in or lend to renewable energy projects.
	**Regional and international institutions** in the renewable energy sector. **Bilateral and multilateral agencies** for international (development) cooperation.	Support the CaDRE financially and technically and specify priorities and areas of cooperation and coordination; obtain the information for designing target-oriented capacity development measures and align activities to the policy of government and other donors.





2

The CaDRE process

The four CaDRE levels

A CaDRE needs to be comprehensive and cover all aspects of renewable energy deployment (such as policies, legal and regulatory frameworks, market structures and the solar and wind value chains) and all the capacity levels that influence this process (system, organisational, individual and cross-cutting networks).

The CaDRE approach is based on the notion that the successful development of the renewable energy sector is possible when the necessary capacities exist at the following levels *(see also Table 2.1)*:

	**The system level**	Covers the enabling environment and framework conditions for renewable energy, such as policy goals, appropriate laws, infrastructure and regulations and standards for facilitating the market penetration of renewable energy.
	**The organisational level**	Covers institutions and organisations (regulatory authorities, service providers and front line agencies, research, educational, training and finance institutions and private sector representatives), and their ability to effectively cope with their mandates and to adjust their operations to changes.
	**The individual level**	Covers the awareness, knowledge and technical and managerial skills of staff in government institutions and agencies, non-profit organisations, the private sector and civil society to develop, implement, manage and use renewable energy. It also considers the present and future potential for jobs generated directly from the sector.
	**Networks**	Covers cross cutting issues that come up at communication and negotiation platforms between stakeholders sharing similar interests and/or areas of work. It also covers the ability of these networks to get the various stakeholders involved, strengthen their joint vision, goals and values, improve their relationships, build trust and increase knowledge exchange.

Table 2.1 Capacity levels and observation fields

	Capacity levels			
	System	**Organisational**	**Individual**	**Networks**
Observation fields	- Social, technological, economic, ecological and political trends - institutional landscape - existing and lacking functions and services in the sector - governance/ accountability relations - policies and strategies - interests and influence of stakeholders - investment structure.	- Mandate - steering and structure - organisational culture and workflows - resources (finances, material, staffing) - partnerships/ networks - customer-orientation - key performance indicators - management structure.	- Competence of management and staff (including knowledge, skills, behaviour/ attitudes) - awareness and motivation - demand for skills development/required human capacities in the sector.	- Active involvement of stakeholders - strengthening joint vision and values - level of confidence between stakeholders - transparency and equal access to information - effective knowledge management.

The CaDRE steps

The CaDRE process consists of deciding exactly what will be analysed (the geographical and technological focus, level of capacity etc.), carrying out the diagnostics and finally generating and prioritising recommendations for a capacity development strategy. Thus the CaDRE process contains three main steps that may vary in intensity depending on the type of CaDRE selected (quick, partial or full):

Step I – Scoping – analyses the context defines the scope and plans the execution of the CaDRE. *The core results* of this step are an overview of the analysed context, a common understanding of targets and a decision on the extent of the capacity needs diagnostics. Roles, responsibilities, tasks and deliverables for the capacity needs diagnostics are also defined and the first major gaps identified.

Step II – Diagnostics – analyses the capacities already in place at the individual, organisational and institutional level and what is required to reach targets. The related strengths and weaknesses of the overall system are identified. *The core result* is an overview of existing and lacking capacities related to the renewable energy sector target.

Step III – Review and recommendations – the findings of the needs diagnostics are summarised, prioritised and communicated among the stakeholders involved in decision-making. *The core result* is a decision on the recommendations that will lay the foundations for a comprehensive capacity development strategy. This would be the next phase in the overall capacity development process.

The characteristics of CaDRE

CaDRE guides policy-makers, organisations and capacity development practitioners as they create an enabling environment for renewable energy. This means CaDRE has the following characteristics:

Comprehensiveness
CaDRE focuses on the solar and wind sectors, but its analytical framework should not be restricted to these two sectors. All capacity levels (system, organisational and individual) should be integrated into the analysis.

Flexibility
Even though this *Handbook* suggests a series of modules and tasks to follow, it is not meant to be a rigid approach. Depending on the context in which CaDRE is applied, elements can be removed or added to cover the needs at hand.

Process orientation
A full picture of capacity needs can only be achieved if the diagnostic method is process-oriented. CaDRE should focus on the processes and changes required by the energy sector to get to the capacity level required for the sector to function.

Continuity
Capacity development needs vary over time. Hence, CaDRE should not be a one-time effort. In order to evaluate the process of closing identified capacity gaps and to capture and react to changing demands for capacity as the market evolves, CaDRE results should be reviewed periodically.

A properly conducted CaDRE has the following positive impacts:

- **Facilitating dialogue** and negotiation between the public and private sector: A comprehensive diagnostic process brings together representatives of all relevant stakeholder groups. Dialogue can contribute to the establishment of a development consensus. It can provide the foundation for setting commonly agreed capacity development targets and for executing a joint, result-oriented response (*Case Example 1*).

- **Creating ownership** over of the capacity development processes: CaDRE requires substantial input and effort, as well as financial and managerial commitments. The awareness and knowledge gleaned from the analysed sector accompanied by the responsibilities of key stakeholders creates the right conditions for owning the process.

- **Increasing transparency:** The intensive analysis of processes and structures in the wind and/or solar energy sector helps create greater transparency among relevant stakeholders. To guarantee transparency, the CaDRE results should be shared with all the organisations concerned. Sharing problems and discussing ways to solve them is an important aspect of a transparent and successful capacity development process.

Case Example 1 ER2E Tunisia – the importance of stakeholder dialogue

The ER2E is a project funded by the *German Federal Ministry for Economic Cooperation and Development* and executed by GIZ since 2003. The aim is to advance the deployment of renewable energy and increase energy efficiency in Tunisia.

Among other activities, ER2E has contributed considerably to increasing stakeholder dialogue between the different players in the Tunisian energy sector. Representatives of the private sector and civil society were systematically involved in elaborating a national strategy for expanding the power sector to 2030. They were also involved in the development of national support mechanisms for renewable energy, increasing ownership and consensus and thus the effectiveness of these concepts.

The importance of stakeholder dialogue in Tunisia becomes especially evident when one considers that 70 % of the investments required to achieve the goals of the Tunisian solar plan will have to come from the private sector.

Source: ER2E project GIZ, 2012a

The key elements of CaDRE

CaDRE only makes sense when a group of stakeholders wants to change and improve the conditions that influence the success of solar and wind energy deployment. In order to make that transition, it is necessary to clearly define the desired result. The involved stakeholders need to **create a joint vision** *(Case Example 2)*.

A clear vision, or what is referred to as a **target** in this *Handbook*, helps identify which key adaptations and developments are needed to achieve it **(capacity needs)**, the potential of the existing system to cope with the relevant challenges **(existing capacities)** and the capacities still missing and in need of development **(capacity gap)**.

The construction of a **Target Model for the wind and/or solar energy sector** (abbreviated as Target Model) helps to answer these questions in a structured way. *Tool 6* in the *Toolbox* is geared towards constructing the Target Model, and further suggestions on how to build and use the model are given in each module of the *Handbook*, as it is applied throughout the entire diagnostic process.

The Target Model fulfils the following functions:

- It provides a working tool for creating a comprehensive overview of all crucial topics, processes, issues and needs at all steps of CaDRE.
- It helps stakeholders define a commonly held clear vision and realistic targets for wind and/or solar development *(during Step I – Scoping)*.
- It acts as a reference model to identify existing and lacking capacities *(during Step II – Diagnostics)*.
- It acts as a main source for recommendations on possible capacity development programmes *(during Step III – Review and recommendations)*.

Case Example 2 A network for the grid integration of renewable energy in Chile

With an increasing amount of electricity generated from renewable energy sources the Chilean electricity sector is concerned about the maximum participation of renewable generation that the country´s electricity systems can support without affecting energy prices, economic efficiency, and security of supply.

For sound decision-making and policies based on reliable facts the *Ministry of Energy* is cooperating with Germany on the development of long term energy scenarios which are compatible with energy policy targets.

An interdisciplinary task force was created for this purpose that involves academic groups and policy makers. The aim of the group is to analyse the feasibility of diverse techno-economic models of the future energy mix and grid expansion, based on high resolution GIS information on renewable resources, land-use restrictions and infrastructure.

Source: GIZ 2012b, Chile - Expansion strategy for grid-connected renewable energies.

The Target Model is structured the following way:

- **Core areas** define the elements of the sector/organisation that have to be in place and functioning. Core areas include the wind/solar resource potential, policies, legal framework, regulatory structure, investment and finance, renewable energy technologies etc. (*Checklist 1 in Module 1.2* provides an overview of possible core areas).
- **Applications & processes** – each core area is governed by certain processes and topics. For example, the core area *education and human resource development* has to include processes like curriculum development, human resource management, preparation of education plans including certification procedures and requirements, vocational training, laboratory installation and management etc.

Table 2.2 provides a simplified illustrative example of a Target Model with details shown for one area. In order to construct this type of overview, it will be necessary to take a number of steps and acquire particular information. These are outlined in more detail for each module of CaDRE in *Chapter 3*.

Table 2.2 Template for a Target Model

		Target	Required capacities	Existing capacities	Capacity gap
	Core area 1				
Applications & processes	Primary schools	...	...	...	...
	Universities	Establish an MSc programme for engineers to specialise in wind farm development.	**System level** Government support to cope with larger numbers of students and develop the programme (€ 2 m /year). **Organisational level** Ability to work out a curriculum. Networks to adapt to technological developments. **Individual level** At least three professors who teach relevant topics: wind turbine design, wind park development and resource mapping.	**System level** Government supplies same budget to university every year. Public budget for universities limited. **Organisational level** University has two partnerships for research on wind turbines. **Individual level** The engineering institute has two professors who research wind turbines.	**System level** Lack of finance options. Government not able or willing to invest. **Organisational level** Existing networks may be inadequate for the appropriate curriculum. **Individual level** Further staff needed to cover wind park development and resource mapping.
	Vocational training providers	...	...	...	...
	Core area 2				
		...	...	...	...

For each core area of the sector and its respective processes, the model provides an overview of the required and existing capacities and the resulting capacity gap at all levels (system, organisational and individual).

Stakeholder analysis plays a key role in the elaboration of the Target Model and is also applied throughout the entire CaDRE. Because of the variety of subsectors in wind and solar energy, the Target Model may need to address:

- private and public sector stakeholders
- small decentralised organisations as well as the large national energy utilities
- authorised participants and freeloaders
- technical, financial, management and administrative skills.

The organisations responsible, involved or affected have to be captured in the Target Model. A stakeholder analysis incorporates the system, organisational, individual level and networking capacities. It considers the role of the whole range of stakeholders in the solar and/or wind sectors and at their relationships and networks.

For every process, the number and type of stakeholders involved as well as their relationships and roles vary. Several stakeholder landscapes might therefore be required to obtain the desired information.

Handbook structure

The structure of the CaDRE *Handbook* follows **the three CaDRE steps:** *Step I Scoping*, *Step II Diagnostics* and *Step III Review and recommendations*. For each step, we provide the following:
The steps and tasks outlined in this *Handbook* are not meant to be exhaustive. There is no one-fits-all solution: CaDRE needs to adapt to the local needs and conditions. Single modules and tasks can be skipped and repeated, as the context requires.

Modules describing the stages and tasks necessary to achieve the desired results.

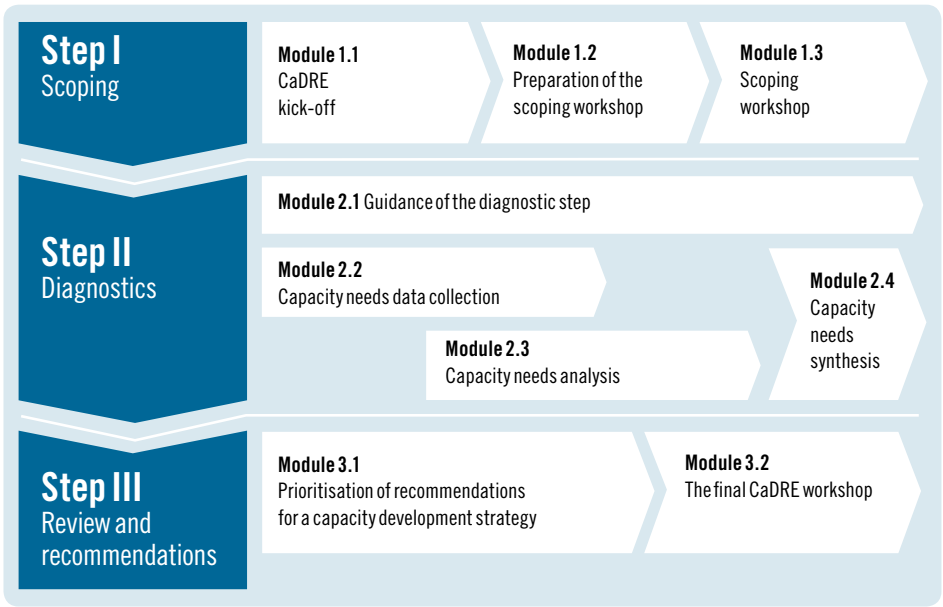
Task sequences which are explained briefly and include a reference to supportive tools, checklists and likely results. The task sequences do not need to be followed in a strict, linear timeline but should be understood as an iterative process. Activities can be carried out in parallel, rather than one by one.

A detailed description of each task outlined in the sequence. Practical checklists and references to tools available in the CaDRE *Toolbox* support the completion of each task.

Checklists that help to understand the tasks in more detail and provide guidance through the diagnostic process.

Tools that give practical support for collecting and analysing data and/or visualising results.
The tools are compiled in the CaDRE *Toolbox*.

Figure 2.1 Overview of CaDRE steps and modules

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recommendations
priotities
system
organisations
opportunities
development
potential
institutional strengthening
dialogue

3

Technical guidelines

Initiating a CaDRE

In most countries, the renewable energy market is both policy-driven and privately-led. Capacity development takes place at different levels and involves different types of stakeholders: government institutions planning and implementing sector reforms, government technical institutes for planning, regulation and control, chambers for advocacy, consultants for advisory services, academia for research and multilateral organisations for development cooperation. The capacity development strategy resulting from the analytical framework proposed will be complex if it tries to cover all stakeholders and elements needed to develop a solar or wind energy market in a particular country. The question is: who should initiate the process and under what conditions is CaDRE successful?

Government as initiator: Renewable energy target setting is a government decision that goes beyond technical and economic analysis and in many countries is subject to political considerations. Given the political dimension, the decision to initiate a comprehensive capacity development process could be launched and supported by a top level government body like the energy or environment ministry in collaboration with the finance ministry and/or education ministry.

If CaDRE is initiated, implemented and coordinated by the government, agreements between the responsible government agencies and/or ministries are required. CaDRE is also an instrument for the government to align and coordinate the activities of international cooperation partners.

Case Example 3 Organisational analysis of the Ministry of Energy and Mines in Morocco: improvement of key processes and strengthening of internal resources

In 2009, the (former) Moroccan minister, Amina Benkadra, realised the need to improve internal work processes, adapt organisational structures, establish a leadership culture and support internal and external services in all the fields of activity of the *Ministry of Energy and Mines*. This would stimulate an improvement in the ministry's performance. With the support of GIZ, the energy department completed a detailed analysis of its internal processes and structure in order to identify capacity and performance gaps but also existing strengths. The conformity of processes was analysed based on ISO 19011. Adaptations were made in line with ISO 9001. The processes already successfully improved are, among others, the handling of petitions, as well as questions from parliament, the creation of legislative and regulatory texts, the management of international bilateral and multilateral agreements, budget management and asset maintenance.

The first phase of this work will be finished in mid-2012.

Source: GIZ, 2011c

Individual public or private organisation as initiator: For individual organisations, conducting a CaDRE is an opportunity to critically assess internal processes and capacities, as well as relationships with other stakeholders in the solar and wind energy sector *(see Case Example 3)*. The focus is on identifying capacity development needs for those service and production chains that are within their zone of influence. Nonetheless, the CaDRE results may lead to suggestions for improvement relating to, for instance, the legal and regulatory framework conditions at policy (system) level.

External agent as initiator: For external agents, such as bilateral and multilateral development cooperation agencies, CaDRE can be a useful tool to create a full and comprehensive view of the capacities required within the solar and/or wind energy sector in a particular area or country and support the design of programmes and projects. The next step – designing capacity development measures and making them happen – requires formal cooperation agreements with national or local institutions. The cooperation can be with the government if the planned programme/project has a strong policy component or it can be with individual organisations, e.g. when the focus is to strengthen particular institutions.

A successful diagnostic process will include the following:

- A decision on whether to focus purely on the **national level** or to include **provincial and local levels**.
- The prioritisation of **core areas in the wind and/or solar sector** e.g. institutions, market applications, technologies and processes.
- **The managerial and financial commitment** of the initiating organisation. This has to be combined with **the motivation and perspective** to use the results to elaborate and implement a capacity development strategy.
- The heavy involvement of **committed key stakeholders**. These could, for instance, be interested in improving their capacities and in taking advantage of opportunities for new sales or procurement business, which will improve renewable energy availability.
- **Qualified experts** to do the conceptual and technical work.

Step I – Scoping

The decision to start a CaDRE should be taken by the organisational leaders. A technical coordinator and a technical team for the execution of the CaDRE should be appointed. Depending on the type and scope of the CaDRE this can be qualified in-house staff or a consulting firm.

Step I consists of three modules, in which the CaDRE scope is agreed among the stakeholders involved. Expectations concerning the process, outputs, and follow-up are clearly formulated and aligned:

- *Module 1.1* outlines the tasks needed to kick off the CaDRE, such as appointing a professional team and conducting a preliminary analysis to identify the core areas of concern and related stakeholders.
- *Modules 1.2* and *1.3* underpin the preparation and execution of the scoping workshop, in which the major milestones for *Step II* are discussed and agreed.

Before getting started, the CaDRE team should evaluate which of the proposed modules and tasks are useful and whether there is a need to apply additional tools or add further tasks to the process. CaDRE should be fine-tuned to the specific context of analysis.

Results of Step I

The results are documented in a report that might include the following:
1) Scope and type of CaDRE to be conducted and key information needed:

- **target(s)** to be achieved in the wind and/or solar sector
- **objectives and scope** of the CaDRE
- **key stakeholders** to be primarily addressed and involved
- draft of the Target Model of the wind and/or solar energy sector to be either entirely or partly assessed

- **type of diagnostics** intended including the selection of the focus on the core areas and key stakeholders
- **compilation of readily available material** to be used throughout the diagnostic process including the existing policies, legal settings and importance of the sector.

2) Plan of operation:

- appointment of the CaDRE leader(s) **and identification of the clear roles and responsibilities** of the stakeholders involved
- identification of the people/institutions that will design and execute the CaDRE, including their Terms of Reference (ToR)
- decision on a draft **plan of operation** for the CaDRE including planned activities, timelines milestones and deliverables
- decision on the overall **budget**
- **formal agreements between and commitments** by involved stakeholders
- creation of a **communication strategy** and an invitation to relevant wind and solar energy sector organisations to participate in the CaDRE. Press release if necessary.

Module 1.1 – CaDRE kick-off

Lead / owner	The lead, supported by a technical coordinator.
Timeframe	One to three weeks.
Results	- The budget for the scoping workshop is available and approved. - The type of CaDRE is suggested for the scoping workshop. - The stakeholders involved in planning and executing the CaDRE have acquired an overview of the energy sector. - The individuals in charge of preparing the scoping workshop have been selected.

In order to provide guidance throughout the scoping process, the CaDRE team needs a good overview of the country, the energy sector and/or organisational scope of its work. For this purpose, a short preliminary context analysis in the form of a desk study provides the input. The study should collect general information on the energy sector as a whole, as well as key information on the solar and/or wind energy sector and relevant organisations. Based on this information and other criteria, the most appropriate type of CaDRE can be chosen.

Task sequence CaDRE kick-off

Task	Description	Main results
1. Hire or designate a technical team for scoping	Scoping should be organised by a core CaDRE team: prepare ToR and hire team. *Tool 1 – Terms of Reference (ToR)*	A technical coordinator and a team can get started.
2. Conduct preliminary analysis	Compile general energy sector information through desk research as background to the scoping. It should at least cover the questions provided in the checklist below. Send the desk study to all stakeholders involved in the scoping. *Checklist 1 – Questions on the general energy sector* *Checklist 2 – Suggested content of the preliminary context analysis* *Tool 2 – Fact finding sheet* *Tool 3 – Energy data templates* *Tool 4 – Report guideline*	Background information is available and is sufficient to understand the main issues to be considered during the CaDRE scoping. Key stakeholders are informed about the next steps.
3. Work out the type of CaDRE required	The suggestion is based on targets, scope, budget and time available. *Tool 5 – Type of CaDRE – decision guidelines*	A recommendation on the type of CaDRE is available for discussion and decision-making in the workshop.

Important comments

The preliminary context analysis shall contain sufficient background information on issues important to the scoping of the CaDRE but no in-depth analysis is required at this stage.

When it is clear from the beginning only a quick diagnostics is planned, the preliminary context analysis can be more extensive and analytical.

Task 1 – Hire or designate a technical team for scoping

Tool 1 - Terms of Reference (ToR)

The size of the CaDRE team, as well as the skills required within the team, largely depend on the scope and type of CaDRE. In general, the following functions should be covered:

- The **lead**: a person or group of people, e.g. a **steering committee**, has the role of initiating and coordinating the overall process.
- The **technical coordinator** is responsible for managing and supervising the technical work.
- The **technical team** is needed to do the ground work. They should bring together complementary skills. Previous experience in capacity diagnostics and capacity development, as well as methodological skills and knowledge of the local and international renewable energy sector, especially in wind and solar energy, are crucial.

Team training

It is strongly recommended that the technical team is trained in the CaDRE approach to get high quality results. Not only will this guarantee an efficient process but it will also ensure that it can be replicated and also compared to other CaDREs.

It is a good idea to identify representatives of key stakeholder groups that can contribute to the CaDRE as **resource persons** *(see Tool 1 - Terms of Reference (ToR) in the Toolbox).*

Task 2 – Conduct preliminary analysis

Tool 2 - Fact finding sheet
Tool 3 - Energy data templates
Tool 4 - Report guidelines

The context analysis should supply the first overview of the energy sector and the importance/share of the renewable energy sector (wind and solar energy).

It must should specify the sources of the information, including comments on their reliability. If the required information is not available, the report should explicitly state this. The report should not be longer than 25 pages. Possible sources of information may include:

- energy sector reports and media reports
- statistical yearbooks
- global databases
- public or private energy providers
- national reports on (renewable) energy programmes.

Checklist 1 Questions on the general energy sector

Topic	Main questions for the overview
General energy sector	☑ What is the country's energy mix? (Primary energy supply, final energy supply, final energy consumption). ☑ What is the share of renewables? Split by sources (*Tool 3 – Energy data templates*). ☑ What are the market structures and monopolies? ☑ Which percentage of the population has access to electricity in urban and rural areas (grid/off-grid access)? ☑ Is transmission capacity available in regions with high potential for renewable energy generation? ☑ What are the costs of renewable energy generation compared to conventional options?
National goals for renewable energy deployment in place	☑ What is the status of policies and financial incentives to support renewable energy development? ☑ Does the country have a national programme/strategy for renewable energy? ☑ When was the strategy/ programme developed? Is it in its implementing phase or is the implementation terminated? What has been achieved? Is a continuation/ follow-up planned? ☑ How does the private sector perceive the programme? ☑ What are the main activities foreseen, areas of intervention and timelines? ☑ Who is responsible for implementing the programme/strategy? ☑ What is the current scale of private sector investment in renewable energy by technology and what are the growth rates? ☑ Does the country have a national climate change strategy? Any CDM projects in the renewable energy sector? Any renewable energy NAMAs?
Resources	☑ What are the renewable energy resources available in the region/country and how abundant are they? ☑ Was the technical potential evaluated? Have measurement campaigns been carried out?
Institutions/ organisations	☑ What are the main public institutions in the energy sector (ministries, departments, authorities, regulators, utilities)? ☑ What is the key institution(s) for solar and wind energy? ☑ Which international/regional organisations and (bilateral) development partners (if applicable) are active in the energy sector?

Checklist 2 Suggested content of the preliminary context analysis

The context report needs to be concise (maximum 25 pages excluding annexes). It is a desk study rather than an in-depth analysis. However it should mention obvious capacity gaps, such as a lack of regulations and/or institutions/organisations.

A. Introduction and executive summary.

B. Main content
   1. Overview of the general energy/electricity system *(see Tool 3 – Energy data templates)*
      a) description of current issues and status relating to energy in general and
      b) particularly renewable energy (e.g. name of main projects and installations, type of installations).
   2. Brief overview of the wind and solar resource potential (wind conditions, solar radiation, etc.) (maximum 1 page – maps in annex).
   3. Existing goals of the government – development goals for the energy sector
      a) general (include energy efficiency and climate change goals)
      b) for renewable energy in particular, *focus on wind and solar sources and supply structures.*
   4. Existing laws concerned with energy
      a) regulations and laws specifically on electricity feed–in and supply and also planning and markets
      b) regulations and laws on renewable energy in particular (feed-in tariffs or similar incentive/support mechanisms).
   5. Legally binding technical instructions and ordinances relevant to renewables, focusing on wind and solar energy.
   6. Non-legally binding public or private guidelines for renewables, focusing on wind and solar energy
      a) national and regional energy development plans and concepts
      b) policy guidelines and concepts
      c) technical guidelines.
   7. Research papers/reviews (only main and comprehensive ones).
   8. Institutions and organisations: focus on those that deal with renewables, especially wind and solar (name institution and its general mandate)
      a) public institutions
         i) ministries responsible for energy/electricity with their main directorates or departments
         ii)technical and regulating government agencies including standard-setting bodies for electricity
      b) independent institutions and agencies
      c) private institutions (including industrial associations, chambers)
      d) civil society organisations (including NGOs)
      e) academia (universities, training centres, research centres)
      f) international/regional organisations and (bilateral) development partners.
   9. Market analysis including share of main utilities etc.
   10. Perception of renewables in public and political debate and in the media.

C. Observations, limitations, comments on the lack of information.

D. References.

E. Acronyms.

F. Annex.

Task 3 – Work out the type of CaDRE required

Tool 5 - Type of CaDRE - decision guidelines

Criteria for selecting the CaDRE approach

CaDRE follows a flexible and modular approach, which can be adapted to the specific needs of a country or to those of the initiating organisation. The type of CaDRE depends on the analytical depth (i.e. the need for qualitative or quantitative diagnostics), as well as on the focus (i.e. the need to analyse the whole wind and/or solar energy system or only parts of it). Finally, it depends on the time, human and financial resources available.

Several key issues will inform the design of the CaDRE. These include the determination of the primary technologies, applications, processes and sectors of interest and the key stakeholders. First of all, there is a need for awareness of the considerable differences between solar and wind energy:

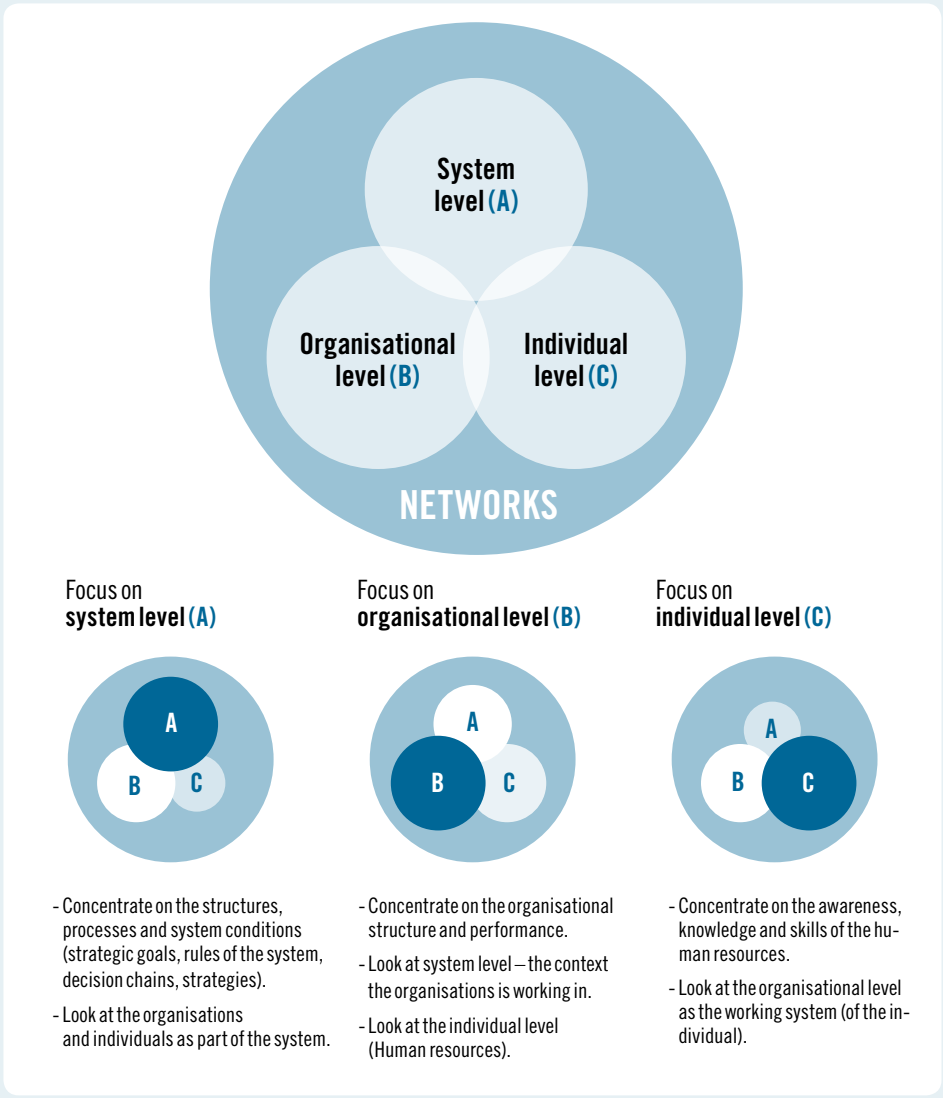
The wind sector is characterised by medium and large scale power generating wind farms. Typical stakeholders include private companies and private sector associations, public bodies at a national, provincial and municipal level as well as utilities in their various forms.

The solar sector is characterised by small, medium and large sized power and heat generation systems. Off- and mini-grid solutions like solar home systems need to be considered, as well as larger grid connected systems. NGOs and private households play an important role for local systems as do the typical stakeholders already outlined for the wind sector. Thus the following questions need to be addressed:

- *Will the diagnostics cover solar and wind energy technologies and processes or a subset?*
- *For the selected technologies and processes, which applications and processes are of highest priority?* For example, will the diagnostics address capacity needs primarily for grid-scale electricity generation, mini and off-grid electricity generation, heating and cooling, cogeneration, fuels and transportation or direct productive uses (e.g. agricultural crop drying, water pumping, schools and health centres).
- *In what sector is there the greatest need for improved capacity to advance the use of these applications?* For example, is the priority improved energy services for the agricultural, building and commercial, industrial, residential, transport or other sectors? Identification of the key sectors will help determine what characteristics of the energy service (e.g. low cost, reliable and/or clean) are required and the type of capacity required to support these applications.
- *What level of capacity should be primarily addressed?* The CaDRE can focus on just one of the capacity levels. Nonetheless, experience clearly indicates that focusing on a single dimension is appropriate only when the other dimensions have been taken into account *(see Figure 3.1)*.
- *Which stakeholders have the most influence on sucessful technology deployment for different applications?* For example, for grid-scale renewable energy electricity generation the key

stakeholders may be the utilities, regulators, system operators, the energy ministry, project developers, technology suppliers, financial institutions, educational and training institutions, research institutions (if there is a need for further technology development and adaptation to the local conditions) and possibly NGOs acting as grass roots stakeholders in the development of renewable energy projects.

Figure 3.1 CaDRE focus and levels that have to be included



Once these questions are answered, a methodology for evaluating the capacity needs for each of these organisations, for the priority applications and sectors of interest can be developed. This includes not only the selection of one of the five types of needs diagnostics which require different levels of professional, financial and time resources but also the core areas and focus on different appliances and processes of the Target Model *(see Task 4 – Draft the Target Model and map the key stakeholders)*. The five types of CaDRE are:

Type 1: **Quick diagnostics** is the least intensive type of CaDRE, meant to provide a preliminary overview of the solar and/or wind energy sector and of the most urgent capacity development needs *(see Case Example 4* for an example). After the quick diagnostics, it may be decided that a partial CaDRE on specific core areas or a full CaDRE is required.

Timeline estimation: Depending on the information available and the complexity of the existing wind and/or solar sector the quick diagnostics should take between three weeks to two months.

Type 2: **Partial qualitative CaDRE** focuses either on:

- an *organisation and its direct relationships* with others (including its mandate, processes, technologies and services and its socioeconomic context), or
- one or more (not all) *core areas* of the Target Model such as education, operation and maintenance, regional energy planning or the system of policy formulation.

A decision to focus on strategic issues can be a reason for choosing a partial CaDRE. Another argument for a partial CaDRE is the limited availability of financial resources. Normally, a partial CaDRE is useful in relatively mature wind and/or solar energy systems in order to optimise the areas with the greatest needs for enhanced capacity.

Type 3: **Partial quantitative CaDRE** *additionally* includes quantitative analyses, in order to design prediction models for supply, consumption or employment effects; however the availability of appropriate information, time and budget are important considerations for quantitative research. **Quantitative diagnostics** can be much more laborious and budget intensive than qualitative ones. Quantitative approaches usually need statistical data, which is often not readily available. This would require the CaDRE team to conduct its own research. Reasons in favour of including quantitative approaches with quantitative approaches are:

- The need for hard data to make investment decisions for long-term, capital-intensive capacity development measures e.g. the elaboration of the curriculum for universities and technical schools. Skilled labour provision for solar and wind should be demand driven and requires estimates of the labour market development.
- The justification of strategic policy decisions e.g. employment effects and support schemes.

Timeline estimation: A partial qualitative or quantitative CaDRE can take a team three to six months depending on how many core areas and processes are included.

Type 4: **Full qualitative CaDRE** focusses on *all the* core areas, including processes, technologies and services in the wind and/or solar energy sector achieving a comprehensive picture of strengths and weaknesses of the various levels involved. A full diagnostics is advisable for wind and/or solar energy sectors that are in an early stage of development. Conducting a full CaDRE on an established solar and wind energy sector is far too complex.

Type 5: **Full quantitative and qualitative CaDRE** of the wind and/or the solar energy sector including the elaboration of special quantitative research studies.
Timeline estimation: A full quantitative and qualitative CADRE can take a team five to nine months depending on the complexity of the renewable energy sector and the required additional research.

Main criteria for deciding on the type of CaDRE can be found in *Tool 5 – Type of CaDRE – decision guidelines*.

Case Example 4 Quick diagnostics of Algeria's solar sector

In 2011, GIZ conducted a **quick diagnostics** in Algeria with the focus on the **system and institutional capacities** of the solar sector.

One of the objectives of the diagnostics was to identify opportunities to increase the cooperation between Germany and Algeria in the framework of the implementation of the *Mediterranean Solar Plan (MSP)*. Furthermore, in 2011 GIZ launched a new energy programme in Algeria, on behalf of the *German Federal Ministry for Economic Cooperation and Development*. The diagnostics contributed to the elaboration of a concrete working plan for the programme.

The scope was refined through an analysis through an analysis of prevailing RE policies and goals. To identify system and institutional capacity gaps, representatives of government institutions and the private sector were interviewed. The aims: a) to identify potential capacity gaps in government institutions/agencies, and b) to obtain a better view on the system capacities and prevailing framework conditions for the development of the renewable energy sector. A special focus was the investment climate for national and foreign renewable energy investors.

The first concrete activities are emerging from the diagnostics. In February 2012, the *German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety* initiated an advisory process with the *Commission de Régulation de l'Electricité et du Gaz (CREG)*, the regulating body of the electricity and gas markets. Algerian prices for conventional energy are at present highly subsidised (main source: gas) and no functioning incentive structures for renewable power generation are in place. Germany is now engaged in supporting the government in the elaboration of an appropriate feed-in structure to enable investments in renewable energy.

Source: GIZ, 2011b

Module 1.2 – Preparation of the scoping workshop

Lead / owner	The technical coordinator, supported by the lead.
Timeframe	Two to four weeks (for a two-day workshop).
Information and documents already available	- Suggestion for the type of CaDRE - report: preliminary context analysis for the energy sector.
Results	- The content for a CaDRE scoping workshop is drafted and organisational issues are planned. - All key stakeholders are informed. - A first plan of operation for the CaDRE is defined and available for discussion.

A well prepared scoping workshop is crucial for success. There are a number of tasks that need to be completed and material that needs to be prepared before the workshop. A preliminary analysis of the context, drafts of possible targets and the proposal for specific core areas for the CaDRE contribute to a more focused and efficient workshop. The technical preparation for scoping consists of:

- Drafting a preliminary version of the Target Model for the wind and/or solar energy sector. It should cover policy making and coordination, planning, training, construction, distribution, operation and maintenance and the use of electricity.
- Identifying the stakeholders involved in the wind and/or solar energy sector e.g. policy makers for national and regional energy strategies, financers, developers, regulators, standard formulation, planners, utilities, equipment providers, education, training and research organisations, business associations and organisations, civil society.
- Comparing the results of the draft Target Model with the first rough overview of existing capacities. The first conclusions on potential gaps in the system can be drawn and this may substantially support priority setting for the planned diagnostics.

Task sequence Preparation of the scoping workshop

Task	Description	Main results
4. Draft the Target Model and map the key stakeholders	A Target Model will allow the identification of the main policy and institutional set-up required for a functioning wind and/or solar energy system. Obvious capacity gaps (e.g. the lack of an institution dedicated to solar and wind energy promotion in a country) and fragmented processes can already be detected and documented at this stage. *Checklist 3 – Core areas – the Target Model for the wind and/or solar energy system* *Checklist 4 – Basic Target Model (with example)* *Tool 6 – Target Model* *Tool 7.1 – Stakeholder landscape*	A draft of the Target Model and stakeholder map are available.
5. Identify scoping participants	List and invite stakeholders that should participate in the workshop. *Checklist 5 – Potential stakeholders involved in scoping*	All stakeholders relevant for the scoping workshop are identified and invited.
6. Draft a plan for the CaDRE	Draft/proposal for plan of operation. *Tool 8 – Plan of operation* *Tool 9 – Roles and responsibilities*	Suggestions for a time schedule, responsibilities and deliverables for the CaDRE are available.
7. Organisation of the scoping workshop	Prepare and present budget to scoping workshop funders and - identify venue and costs - identify number of participants (travel, per diems etc.) - identify necessary material (e.g. printouts) and services (e.g. moderators, translators). Prepare the following: - agenda - methods and tools to be used in the scoping workshop. *Checklist 6 – Preparation of the scoping workshop* *Tool 7.2 – Stakeholder selection according to their role and interest in CaDRE* *Tool 10 – Organising an efficient meeting or workshop* *Tool 24 – Communication plan*	The scoping workshop budget is clear and approved. The scoping workshop roadmap is decided.
References to other sections	The preliminary context analysis *(Module 1.1)* is required.	

Important comments

This module is a must for starting any comprehensive CaDRE. Bear in mind that during the preparation, only the perspective of the lead will be taken into consideration. At the workshop new perspectives might reveal different priorities. Therefore the material from the preparation should be seen as drafts.

Task 4 – Draft the Target Model and map the key stakeholders

Tool 6 – Target Model
Tool 7.1 – Stakeholder landscape

One of the basic requirements of the CaDRE is to draft the Target Model and *characterise the stakeholders involved*. A draft Target Model can be elaborated with the information of the preliminary context analysis (*Module 1.1.*) and the template provided in *Tool 6 – Target Model*. At this stage, the focus should be on drafting possible targets for solar and wind energy development and on defining which capacities would be required to achieve these targets. During the scoping workshop (*Module 1.3*), the draft Target Model will help stakeholders generate and formulate a clear joint and vision of what they want to achieve. The analysis of existing and lacking capacities is the focus of *Step II Diagnostics*. The work steps to follow are:

1. Identify the core areas to be suggested for the CaDRE (for example, *see Checklist 3*).
2. Define the respective relevant topics/processes.
3. List stakeholders related to the topics/processes in focus.
4. If possible, make initial suggestions about the readily observed existing and lacking capacities (*see also Case Example 5*).

Case Example 5 The Technology Action Plans of the Major Economies Forum (MEF)

The MEF was launched in December 2009 and is intended to facilitate a candid dialogue among major developed and developing economies and advance the exploration of concrete initiatives that increase the supply of clean energy.

As an initial step, a suite of plans that span ten climate-related technologies were drawn up together with the 17 member countries of MEF.

The technology action plans for solar and wind provide detailed information on market development and trends for solar and wind energy technologies, elaborate on the barriers to wind and solar energy technology development and deployment and refer to best practice policies to overcome these barriers. Actions to accelerate the deployment of these technologies are suggested as well.
Source: Major Economies Forum – MEF, 2009a and b

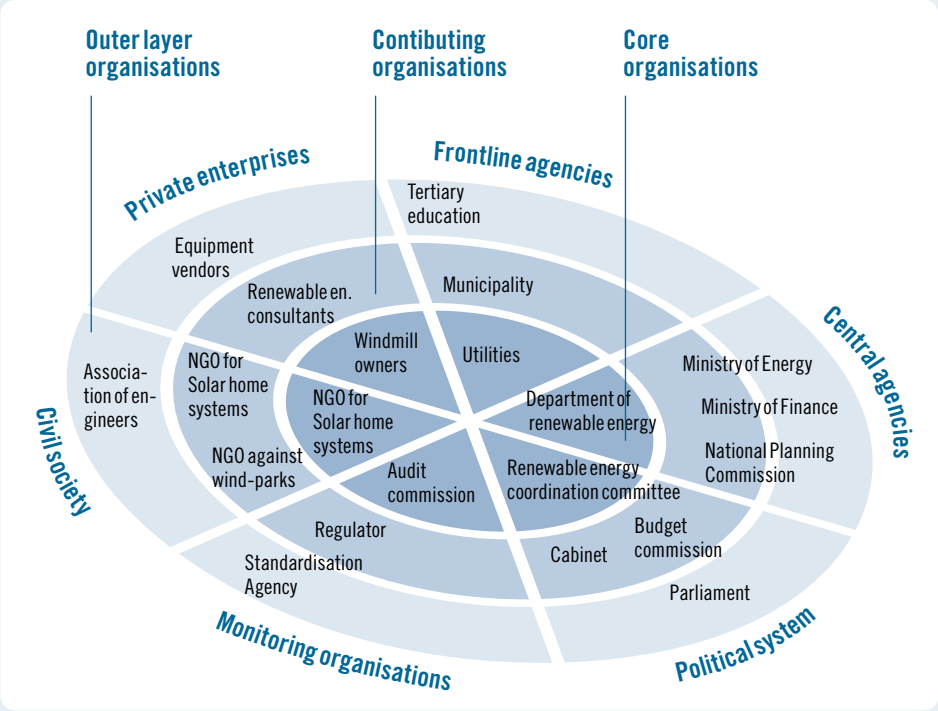
For each core area and topic/process of the Target Model the (main) **stakeholders** should be classified as follows:

- political system (political structures with a role in policy formulation and supervision)
- central agencies (agencies/institutions with roles in policy making, central planning, education, business promotion and governance)

- frontline agencies (units actually delivering services, both public and private suppliers like production, distribution, maintenance or supervision)
- private sector and business (producers, importers, developers, installers, chambers of commerce)
- research institutions
- educational and training institutions (universities, training centres etc.)
- checks and balances (auditor-general, standards, ombudsmen, the complaint and redress system, the judiciary) that keep operations in line
- civil society (organisations and interest groups representing demand for services or to whom accountability may be important).

Make a comprehensive picture of the stakeholders by using *Tool 7.1 – Stakeholder landscape* and other supportive tools. The Target Model draft and the stakeholder landscape have to be discussed during the scoping workshop. Inputs from the participating stakeholders are necessary in order to complete the picture. To improve the level of understanding and increase participation during the workshop the draft documents should be circulated before the workshop.

Figure 3.2 Example of a stakeholder map



Checklist 3 Core areas – the Target Model for the wind and/or solar energy system

Core areas (a selection of appliances & processes is listed in *Tool 6 in the Toolbox)*
A robust deployment strategy for wind and/or solar systems has to be integrated into the wider **energy, economic and development strategies**. It needs full political support, budgetary provisions and an implementation strategy. **Core areas** to be considered are: ☑ general policy formulation with goals and objectives ☑ legal framework ☑ implementation strategy defining guiding and supporting rules and mechanisms ☑ investment strategies including tariff structure and incentive mechanisms.
Wind and solar energy production is only possible if **natural resources** (solar radiation and reliable and sufficient wind speed) are adequate and access to the potential sites is not too difficult. On-site measurements are required to select reliable generation sites, especially for wind energy. **Core areas** to be considered are: ☑ natural resources need mapping and assessment to ensure their availability and the planning of distribution and feasible production sites.
The enactment of a policy for wind and/or solar energy systems requires **effective institutions and regulatory bodies**. These allow policy objectives to be translated into clear rules that help guide decision-making without creating undue barriers. **Core areas** to be considered are: ☑ regulatory structure (including technical standards and controlling quality of electricity production and supply service) guidance and control of planned and existing utilities, their performance and the security and safety of supply systems ☑ procedures and approaches ☑ spatial and technical planning of wind and/or solar systems including approval procedures is one of the main tools for translating the intentions of renewable energy supply into assets, power distribution and storage and identifying their locations in the area.
If wind and solar potentials have been assessed, **suitable technologies** to harness these resources and adequate support infrastructure need to be accessible. **Core areas to be considered are:** ☑ technologies for solar and/or wind energy production (electricity and thermal uses).
Human resources and skills are needed for management, planning, administration, construction, asset management and operation, supervision and control and service delivery. Education, vocational training, research and development require the necessary infrastructure, curriculum and teaching methods and experienced trainers and researchers.
Core areas to be considered are: ☑ education and human resource development ☑ research and development.
Without a suitable **energy market structure** and rules for utilities, project developers, construction companies and technology developers (or importers) deployment is difficult or impossible. Scale-up of renewable energy requires energy services to be affordable and cost-effective to satisfy user demand while also providing a viable economic model that allows project developers to recover costs and encourages further investment. **Core areas** to be considered are: ☑ market structure to understand the general business conditions, viability of business models for technology delivery, utilities and their operating conditions ☑ economic, environmental and social impacts.

Core areas (a selection of appliances & processes is listed in *Tool 6 in the Toolbox)*

If all of the above factors are in place, renewable energy projects then need to be **planned, built and operated**. This requires access to financial resources and the availability of people with the right professional/technical profiles and specialist knowledge of wind and/or solar energy technologies.

Core areas to be considered are:

- ☑ project design
- ☑ business case development
- ☑ access to finance
- ☑ building and construction
- ☑ operation and maintenance
- ☑ distribution and grid
- ☑ electricity/heat users, demand.

Checklist 4 Basic Target Model (with example)

		Stakeholders	Target	Required capacities	Existing capacities	Capacity gap
	Core area 1					
Applications & processes	**Applications & processes of relevance for a functioning system.** List main existing and required topics and/or processes (one per row).	Name the relevant stakeholder for the topics/processes specified in the first column.	What should be achieved? - Raising awareness - human capacities - processes and procedures - budget - functional institutions - new institutions - technology development - infrastructure - engineers - etc.	What capacities are required to reach the targets on the: - *system level* - *organisational level* - *individual level* - *networks.*	What capacities exist on the: - *system level* - *organisational level* - *individual level* - *networks.*	What capacities are missing – what is the gap on the: - *system level* - *organisational level* - *individual level* - *networks.*
	Core area 2					
	...	...	...	...	...	...

Task 5 – Identify scoping participants

The participants should be senior managers and other decision makers that have the authority, mandate and influence to make decisions or make decisions feasible. They should cover important functions like policy and strategy formulation, regulations and control, finance, project development, implementation, operation, trade, higher education and training. Depending on the intended scope of the CaDRE (e.g. CaDRE of an institution or smaller network of institutions) the target participants can vary.

Key national, regional or international experts for wind and solar energy can significantly contribute to relevant technical and systemic details. It is advisable to limit the number of participants to representatives of ten to 20 institutions/organisations that are important

- in the selected core areas of CaDRE (partial CaDRE)
- for the analysed institution (partial CaDRE) or
- for the total national or regional energy sector (full CaDRE).

Main areas of expertise and some examples of participants that could be involved are suggested in *Checklist 5* (*see also Tool 7.2 – Stakeholder selection according to their role and interest in CaDRE*).

Checklist 5 Potential stakeholders involved in scoping

Area	List with functions in the (renewable) energy sector *
Policy level	☑ Government focal point: ministry/ministries and directorates responsible for renewable energy, climate change, inter ministerial working groups; senior officials within renewable energy ministry or directorate, with good contacts with ministries and other stakeholders. **Function:** Mandate for the development of the national energy systems (policy formulation, guidance).
Public institutions	☑ Energy and climate change departments or agencies, energy/electricity regulator, academics and research institutes, (vocational) training institutions, public utilities. **Function:** Implementation, training, guidance and control.
International partners/donors	☑ If international cooperation partners/donors have (or want) projects in the field of wind and solar energy or energy efficiency they should be part of the kick-off meeting (this includes development banks and national, multi and bilateral funding agencies). **Function:** Providing funding, using the results for capacity development.
Private sector	☑ Larger private firms active in the renewable energy sector (energy production, distribution, operation and equipment supply) including private companies/utilities, associations of energy providers, independent power producers, renewable energy project developers, commercial banks, renewable energy equipment suppliers and manufacturers, microfinance organisations, chamber of commerce etc.). **Function:** Expertise in the wind and/or solar energy sector, development, planning and implementation.

Area	List with functions in the (renewable) energy sector *
Civil society/ grass roots associations	☑ Grass roots associations often have experience and run their own projects in the sector. Their contribution can make a significant difference. **Function:** expertise in the wind and/or solar energy sector, the voice of users and user interest groups.
Team of experts	☑ Renewable energy experts (consultants) –especially important are wind and/or solar systems experts from ministries, research institutions, private companies etc. They should have a good working knowledge of opportunities and constraints, covering some or all renewables opportunities. **Function:** Expertise in the wind and/or solar energy sector.
Media and information officers	☑ Journalists from print media, broadcasting; the information officers of organisations and enterprises. **Function:** Public awareness raising – information for staff, indirectly involved organisation units in sector associations, institutions and enterprises.

*) This list is only an example and may be changed – it is important that limits are set to numbers of stakeholders actively involved in preparing the CaDRE. This enables effective implementation.

Task 6 – Draft a plan for the CaDRE

Tool 8 - Plan of operation
Tool 9 - Roles and responsibilities

The team should make a preliminary operational plan relating to the steps that will follow the scoping. The first draft **plan of operation** should include a budget estimate as well as timelines for:

- the description of the profiles of the technical team needed for the CaDRE and their selection (including a consideration of the necessary administrative procedures)
- financial resources required
- possible training for the technical team
- design of the CaDRE process
- data gathering - interviews, surveys, additional research studies and their documentation
- refinement of the Target Model and stakeholder assessment
- analysis of the sector information and levels of concern and synthesis of the capacity needs
- elaboration of recommendations for a capacity development strategy
- report and presentation writing, correction and coordination of findings of findings, as well as feedback
- planned workshops and review meetings as part of the stakeholder dialogue

- communication and dissemination of the CaDRE results
- milestones for interim and final reports – for *Step II – Diagnostics* and *Step III – Review and recommendations* separately.

An operation plan should consist of a text and a Gantt Chart. The Gantt-Chart gives a graphical overview of the activities, milestones and their timeline and the text part includes explanations and indicators for measuring the achieved results. Suggestions for the roles and responsibilities should also be made (*Tool 9 – Roles and responsibilities*).

Task 7 – Organisation of the scoping workshop

Tool 7.2 – Stakeholder selection according to their role and interest in CaDRE
Tool 10 – Organising an efficient meeting or workshop
Tool 24 – Communication plan

A scoping workshop is not only a platform for discussing ideas and agreeing on the characteristics of the CaDRE, but should be used to coordinate the next steps, create control and ownership, and to manage stakeholder expectations (*Tool 24 - Communication plan*). The organisation of the workshop means ensuring the availability of resources and content preparation as follows:

- **Equipment, technical facilities, venue** etc.
- **A professional moderator/facilitator:** he/she has the responsibility to suggest and confirm the methods of working and material required. Good moderators/facilitators need some time in advance for preparation.
- **A rapporteur** for the minutes.
- **Presenters of the prepared material.**
  - **Presentations and lead questions.** Overview of the energy sector and the role/trends of the wind and/or solar energy subsectors.
  - The first draft of the Target Model identifying the most important fields and areas for wind and/or solar systems (*Tool 6 – Target Model*). The stakeholder map identifying the most relevant stakeholders in the renewable energy sector with a focus on wind and solar systems (*Tool 7.1 – Stakeholder landscape*).
  - Suggestions for the scope and type of CaDRE required.
- **Preparation of one or more SWOT analyses** of the wind and/or solar sector – the process and appropriate tool is introduced in the next module. Note that one SWOT analysis takes about 30 to 45 minutes.
- **Concise formulation of the objectives** and expected results of the scoping and scoping workshop.

- Decision about whether working groups are part of the workshop approach (to be discussed with the moderator): themes, lead questions and expected results and material for the working groups.

Checklist 6 Preparation of the scoping workshop

Activity for preparation	Likely duration	Party responsible	Results
Initiation and invitation letter.	Two to three days.	Initiating institution/ department.	Invitation letter to key stakeholders describing intentions of the CaDRE and seeking commitment for full engagement.
Hiring the facilitator/ moderator.	Depending on the availability, one to four weeks.	Technical team in cooperation with initiating institution/department.	Facilitator/moderator is hired.
Sending the **invitation** letter and telephone contact.	Two days Invitations should be sent at least three weeks in advance.	Technical team in cooperation with initiating institution/department.	Invitation letter is sent and participation checked.
Preparation of presentations and summaries of the content produced.	Three days at least.	Technical team/ team leader.	Visualisation and reading material.
Detailed discussion and planning with the **facilitator/ moderator** concerning material, tasks and objectives and expected results of the workshop.	Two days.	Technical team / team leader.	Facilitator/moderator has an overview, understands the expected results and has made suggestions for the content preparation/presentation and structure of the workshop.
Identification of **rapporteur** and his/her instruction.	Two days.	Team leader.	At least two rapporteurs are instructed.
Prepare for local event logistics.	Two weeks.	Assistance of technical team, supervised by team leader.	Preliminary logistics arranged (protocol, venue, equipment, hotels, transport, food, translation if required, reception desk, dais arrangement, media etc.).
Check rooms and facilities one day before the scoping workshop.	One day.	Technical team/ team leader.	Functioning equipment (projector, sound system) and preferred seating arrangements (if required for group work) are confirmed and tested. Back-up/spare parts for projector.

Be sure that the material mentioned above is thoroughly prepared and previously discussed with the team leader, the initiator/lead and the facilitator or moderator. Specific hints are compiled in *Tool 10 – Organising an efficient meeting or workshop*.

Module 1.3 – Scoping workshop

Lead / owner	The lead, supported by the technical coordinator.
Timeframe	Two day workshop and one to two weeks' wrap-up.
Information and documents already available	- Desk study: preliminary context analysis of the energy sector - draft stakeholder landscape - draft Target Model - suggestion for the type of CaDRE - draft operating plan - presentations - workshop agenda.
Results	- The key stakeholders reach a common agreement for the target, scope and type of CaDRE and take ownership. - Core areas are identified and the Target Model adapted. - The next steps are defined and the preparation of the diagnostic *(Step II)* of the CaDRE is clear. - If required, contracts for a technical team and a technical coordinator are drawn up, based on a plan of operation for CaDRE *Step II*.

The success of the scoping workshop mainly depends on:

- The thoroughness and quality of the content preparation.
- The moderator is required not only to have a high level of professionalism and familiarity with local context and culture but also to have been introduced to the content and expected results.
- The inclusion of the right participants (representatives of the relevant institutions) who supply decision-making powers, motivation and commitment.

Task sequence Implementing the scoping workshop

Task	Description	Main results
8. Conduct the scoping workshop	In the workshop the draft stakeholder landscape and the Target Model of the wind and/or solar system are presented, discussed and analysed using the SWOT method. The results of the discussion lead to the selection of the type of CaDRE. *The drafts of the content prepared in Module 1.2* *Tool 6 – Target Model* *Tool 7.1 – Stakeholder landscape* *Tool 11 – SWOT analysis*	Stakeholders have a clear idea of the basic gaps and are able and willing to go ahead with the CaDRE diagnostic step.
9. Scoping workshop wrap-up	The results of the scoping workshop are compiled. The scoping report is sent to other stakeholders who will be involved in *Step II*, as decided in the planning workshop. If required, a press release is prepared, announcing the start of a comprehensive CaDRE. *Tool 1 – Terms of reference (ToR)* *Tool 4 – Report guidelines* *Tool 24 – Communication plan*	The results of the workshop are compiled and ready to be distributed to the appropriate stakeholders. Other stakeholders relevant to the CaDRE are informed. The wider public is informed about the challenge to support wind and/or solar energy sector development.
References to other sections	Important inputs are the results of the preliminary context analysis and drafts prepared in *Module 1.2.*	

Important comments

The tasks of this sequence are essential for the planning of the information gathering described in *Module 2.2*.

Task 8 – Conduct the scoping workshop

Tool 6 - Target Model
Tool 7.1 - Stakeholder landscape
Tool 11 - SWOT analysis

The material prepared in *Module 1.2* has to be distributed. While presenting it, main results should be highlighted and a set of questions should be discussed in plenary sessions and/or working groups.

In the workshop, the CaDRE team adapts the Target Model together with the relevant stakeholders. This exercise will help to make a clear and realistic definition of what is necessary to boost solar and wind energy deployment.

Strive for consensus
Often, existing goals and targets are fragmented and diffuse and need to be smoothed and refined. Different stakeholders might have different goals and ambitions, so the scoping workshop should be used as a platform for negotiation.

Through an intensive analysis of the wind and/or solar energy sector and a joint adaptation of the Target Model, stakeholders involved can define a concerted vision of what they can and aim to achieve together, which will ultimately define the scope and depth of the CaDRE.

The Target Model should cover all core areas, topics and processes that could potentially be interesting for the CaDRE. Nonetheless, a crucial issue at this stage will be managing stakeholder expectations and ensuring that the CaDRE scope is realistic and practical. In most cases, it will not be possible to actively address all areas and levels of capacity. The use of SWOT analyses is suggested in order to jointly refine the Target Model and identify the main areas of concern and relevance. Main decisions to be taken (or prepared) are:

- commonly agreed boundaries for the Target Model (scope of the CaDRE)
- confirmation of the type of CaDRE to be conducted
- first definition of all relevant stakeholders in the wind and/or solar energy system
- preparation of a Memorandum of Understanding (MoU) or Letter of Intent (LoI) if required for the support and cooperation between engaged stakeholders in the further process of the CaDRE
- decision on next steps and a first plan of operation.

Task 9 – Scoping workshop wrap-up

Tool 1 - Terms of Reference -ToR
Tool 4 – Report guidelines
Tool 24 - Communication plan

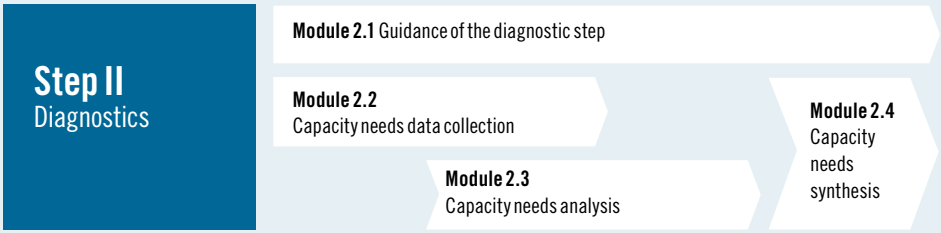
The wrap-up consists of a summary of the results discussed. The **scoping report** should include:

- objectives of the scoping workshop
- decisions made about the type of CaDRE
- objectives and expected results of the planned CaDRE
- adapted Target Model and its core areas

- results of the SWOT analysis
- overview of the capacity gaps already identified and discussed
- list of all relevant stakeholders in the wind and/or solar energy sector with a short description
- decision on next steps and a first plan of operation
- outline of the procedures required to start the diagnostic step – including draft ToR *(see Tool 1 – Terms of Reference -ToR)*
- list of all material already compiled (fact finding sheet)
- copy of the MoU or LoI if required.

The report **should be officially distributed to all stakeholders involved** *(Tool 24 – Communication plan)*.

Step II – Diagnostics



Purpose

Step II is the centrepiece of the capacity development needs diagnostics. The main result of this step is a comprehensive diagnostics of the existing and lacking capacities of the wind and/or solar energy sector (for a full CaDRE) or for selected core areas (partial CaDRE, or a quick diagnostics).

Step II consists of four modules that aim to analyse the existing capacities and the capacity needs in relation to a predefined Target Model.

- *Module 2.1* helps to **design an activity plan** for data collection and a subsequent analysis and synthesis, and to guide the complete *Step II*.
- *Module 2.2* provides **guidance for data collection**, like suggestions for interview and survey design or specific research studies.
- *Module 2.3* explains how the **information can be analysed** and how to set the capacity needs expressed by stakeholders and the needs that arise from the Target Model into a comprehensive context.
- *Module 2.4* provides guidelines for making a **synthesis of the findings**.

UNDP recommends

-"Define desired capacities prior to undertaking the assessment, as they do not emerge from a capacity [diagnostic]."
- "Do not necessarily expect surprises from the assessment, but rather confirmation and consensus."

Before getting started, the CaDRE team should evaluate which of the proposed modules and tasks are useful and whether there is a need to apply additional tools or add further tasks to the process. CaDRE should be fine-tuned to the specific context of analysis.

Results of Step II

The results are documented in a CaDRE report. It includes:

- the **objectives and goals** of the CaDRE based on the scoping report
- an **elaborated** Target Model, including the level of capacities that shall be achieved
- a detailed and a **synthesised overview** of existing and required capacities and the corresponding capacity gap
- **suggestions on next steps** in the review and recommendations *Step III*
- the **methodology** used for the analytical work.

Module 2.1 – Guidance for the diagnostic step

Lead / owner	The technical coordinator, supported by the lead.
Timeframe	One to three weeks for the preparation and accompanying *Module 2.2* and *2.3*.
Information and documents already available	The scoping report – including the draft Target Model and a draft stakeholder list and landscape.
Results	The tasks are meant to prepare the work for *Modules 2.2* and *2.3*. The results are: - A detailed activity plan outlining the information required for the diagnostics is available to start the field work. - The Target Model and corresponding core areas to be analysed are adapted to the specific requirements of the diagnostic step. - The Target Model can now serve as a guide for information gathering. - The relevant stakeholders are described.

In this module the diagnostic step is prepared using the results of the scoping workshop. Please note: Tasks outlined below are highly interrelated and iterative in nature.

1. The Target Model is adapted according to the formulated targets. Depending on the type of CaDRE chosen, the model will need to be expanded or reduced to fewer core areas.
2. At this stage, a list of required information with indications on possible sources and methods to access it should be prepared. The main source of information will be the stakeholders relevant for the core areas in focus.
3. A more detailed description of these stakeholders prior to the interviews/surveys to be carried out in *Module 2.2* is recommended.
4. Finally, the planned activities need to be captured in an action plan in order to ensure a smooth execution of the diagnostic step. Make sure that potential budgetary changes which might arise during scoping (e.g. the need for more consultants) are laid out and presented for approval to the CaDRE lead.

Important note

In some contexts, institutions are not able to carry out their mandate. The causes might be a lack of political support or insufficient resources. An assessment of whether the activities mandate of institutions coincides with the stipulated mandate is recommended. This exercise can reveal critical capacity gaps.

Task sequence Design and guide the CaDRE diagnostic step

Task	Description	Main results
10. Adapt and refine the Target Model	Adapt the Target Model and its core areas as the diagnostic step progresses. *Tool 6 – Target Model*	Detailed definition of the Target Model – adaptation to the concrete requirements of the CaDRE.
11. Detailed stakeholder description	Prepare a revised stakeholder description. Prioritise according to which stakeholders are essential to obtain the required information. *Checklist 7 – Main attributes for stakeholder description* *Tool 7.3 – Stakeholder selection according to their role and interest in CaDRE* *Tool 7.1 – Stakeholder landscape* *Tool 7.4 – Governance map and relationships* *Tool 12 – Zone of influence of organisations*	Stakeholders of all areas and processes under consideration have been mapped and described.
12. Identify missing types and sources of information necessary for the diagnostics	Make an overview of the information required to identify existing capacities and diagnose capacity gaps for the core areas addressed in the Target Model. Plan how to collect required information (desk studies, surveys, interviews etc.) and identify potential sources. *Checklist 8 – Using the basic Target Model to identify required information* *Tool 2 – Fact finding sheet* *Tool 25 – Compilation of key questions for CaDRE*	Required information has been identified, as well as the most effective way to obtain it.
13. Refine the plan of operation	Update the plan of operation based on the results of the scoping workshop – discuss (and get approval). *Checklist 9 Topics to be considered in a plan of operation* *Tool 8 – Plan of operation* *Tool 9 – Roles and responsibilities*	A precise activity plan is available and approved. If necessary, budget adjustments have been laid out and approved.
References to other sections	*Scoping (Step I)* yields important inputs. The tasks of this sequence are essential for planning the information gathering described in the next task.	

Important comments

The main risks are time constraints and unrealistic time schedules. There should be enough flexibility in the overall CaDRE work planning.

Be aware that studies can be endless. Therefore the technical coordinator and lead should limit the amount of research to urgent requirements and integrate further studies into a follow-up programme *(see Module 3.2)*.

Task 10 – Adapt and refine the Target Model

Tool 6 - Target Model

Key questions

- What are the core areas to be included in the diagnostics?
- What are relevant topics/processes for the targets of the CaDRE and involved stakeholders?

The Target Model draft was prepared in *Module 1.2* and discussed and revised during the scoping workshop. The model needs to be adapted and expanded/contracted from time to time as the CaDRE progresses. This work can be quite laborious and needs expert knowledge, not only of the technical issues, but also of the organisations involved in administration, planning and control and in the electricity market, production and distribution processes.

Task 11 – Detailed stakeholder description

Tool 7.1 - Stakeholder landscape
Tool 7.3 - Detailed description of selected stakeholders
Tool 7.4 - Governance map and relationships
Tool 12 - Zone of influence of organisations

Key questions

- Who are the main stakeholders and what are their main functions?
- Is there a need to update the existing list and map?

The point of the stakeholder descriptions and analyses is to know who is involved in the wind and/or solar energy sector, what role they play in the analysed context (mandate, functions and activities). At a later stage of the CaDRE the point is to identify whether they have the necessary abilities to carry out their current and/or future mandates.

Compiling a comprehensive list *(see Tool 7.3 - Detailed description of selected stakeholders, Tool 12 - Zone of influence of organisations)* and secondly mapping the stakeholders in a *landscape* to get a picture of their position in the whole system is suggested *(see Tool 7.1 - Stakeholder landscape)*. This description will be used:

- to identify which stakeholders have a crucial role in the areas to be analysed (reference to the Target Model)
- to identify which institutions, organisations, enterprises or civil society organisations are missing
- to find missing areas and functions necessary in a balanced wind and/or solar energy system
- to prepare interviews and/or surveys
- to identify their ability to carry out their mandates.

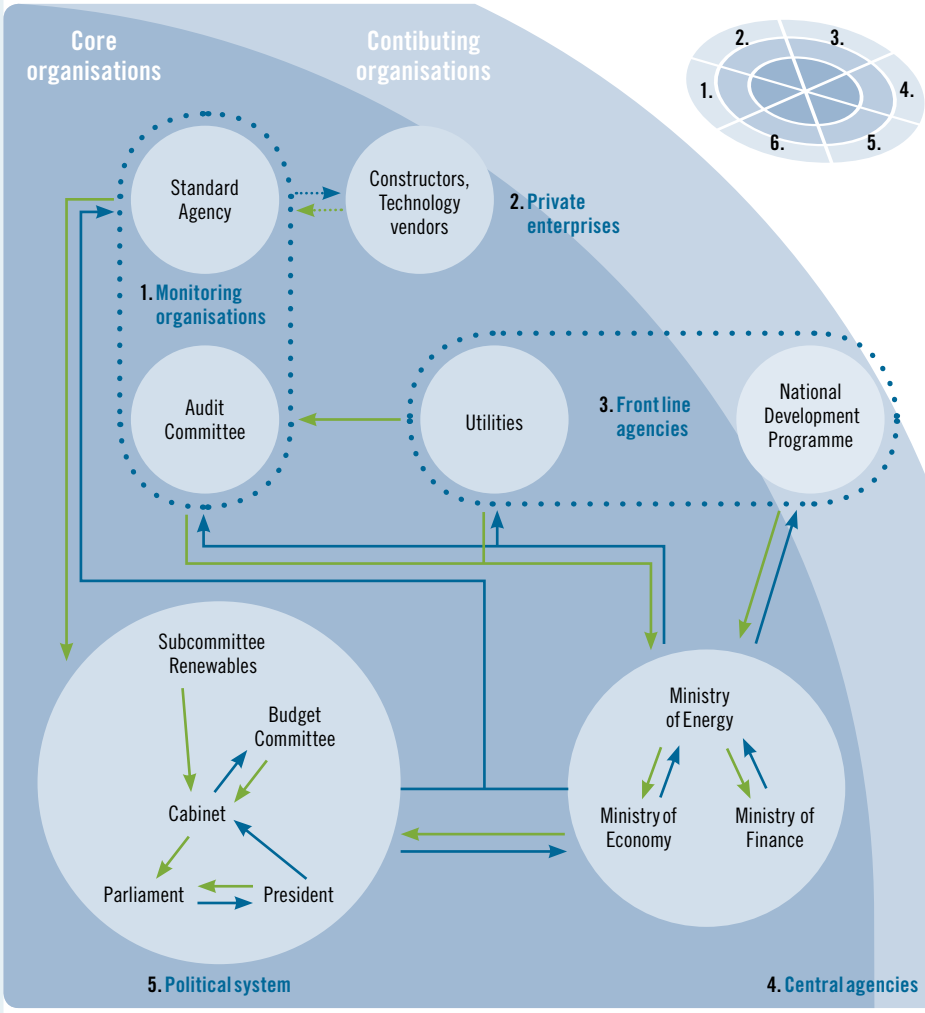
The main attributes for these descriptions are suggested in *Checklist 7*.

Checklist 7 Main attributes for stakeholder description

Topic	
Status	☑ Public, private or autonomous.
Legitimacy	☑ Institutional position – mandate and legal position.
Main stakeholder groups *(see Task 4)*	☑ Civil society organisations and interest groups representing demand for services and to whom accountability may be important ☑ front line agencies and units actually delivering services, both public and private suppliers like production, distribution, maintenance or supervision ☑ central level agencies/institutions with roles in policy making, central planning and governance like central departments and directorates etc. ☑ monitoring organisations (regulators, auditor-general, standard setters, ombudsmen, the complaint and redress system, the judiciary) that keep operations in line ☑ the political system (parliament or other political structures with a role in policy formulation and supervision) ☑ private sector and business (service delivery, utilities, production, planning and consultancy etc.).
Resources	☑ Knowledge, skills and financial and material resources ☑ number of departments or units, staff and their qualifications ☑ infrastructure (offices, branches etc.) ☑ equipment (research equipment, computers, printers etc.) ☑ financial resources ☑ administrative resources.
Position in the system	☑ Core function organisations with a significant role in delivering the key outputs e.g. decision and directing status ☑ contributing organisations with an important but not significant direct role ☑ the outer layer of organisations that have a less important and less significant role ☑ include dependencies, status in the network – direct and indirect connections.
Conflicts and position	☑ Popularity, existing conflicts and competition (can be classified as dividers, connectors or controllers) ☑ power to accelerate or stop developments or activities ☑ strengths and weaknesses of the stakeholders.
Contact details	☑ Contacts (head of organisation or important units, communication officer etc.).
Interest and need for capacity development	☑ High interest and commitment ☑ medium interest and commitment ☑ low or lack of interest and commitment.

Case Example 6 Example of a governance map for the renewable energy sector in Afghanistan (GTZ-ESRA 2009)

Simplified example of a governance map for the renewable energy sector in Afghanistan (GTZ-ESRA 2009). It depicts the governance (blue) and accountability (green) of main organisations in the sector and was used to understand the power structure in the sector. The map is based on the relational analysis explained in *Tool 7.4 – Governance map and relationships.*



Mapping all the stakeholders involved may give a too crowded and confusing picture. It may be appropriate to produce different maps such as:

- A governance map: depicting the governance and accountability relationships of institutions and organisations *(see Case Example 6)* and *Tool 7.4 – Governance map and relationships*.
- Supply chain relations map: depicting the positions and dependencies in a supply chain (e.g. energy production, delivery, control and use) – this can be qualitative or quantitative.

Task 12 – Identify missing types and sources of information necessary for the diagnostics

Tool 2 – Fact finding sheet
Tool 25 – Compilation of key questions for CaDRE

Key questions

Before starting any new data collection, the existing information has to be scanned. Ideally, the scoping has already captured the main information sources and material. The technical team should produce a list with further information needs, based on the adapted Target Model and core areas *(see template in Tool 2 – Fact finding sheet and Tool 25 – Compilation of key questions for CaDRE).*

1. Indicate what information is required including a definition of which levels (system, organisation or individual) and whether quantitative information is useful/required *(see Checklist 8)*
2. Indicate what information needs shall be satisfied..
3. Name the possible sources (e.g. experts, *available* concepts and studies or handbooks, departments, enterprises/utilities).
4. Point out how they can be best collected (e.g. desktop study, request with supporting letter from the lead, interview, own research study).
5. Specify the needed resources (human resources, time and budget).
6. Give deadlines by which the information is required.
7. Name the person responsible for collection.

Checklist 8 Using the basic Target Model to identify required information

		Stakeholders	Target	Issues to be addressed during data collection
	Core area 1			
Applications & processes	**Applications & processes of relevance for a functioning system.** List main existing and required topics and/or processes (one per row).	Name existing/ required organisations and people and their function.	What should be achieved?	Add what information is existing and what is required.
	...	...	...	...
	Core area 2			
	...	...	...	...

Task 13 – Refine the plan of operation

Tool 8 - Plan of operation
Tool 9 - Roles and responsibilities

Key questions

- What are the objectives of the CaDRE?
- What level and which core areas and their topics and processes are the focus?
- How should the data collection, analyses, extraction of capacity needs and syntheses be best organised?

The plan of operation should outline in detail all work envisaged, allowing realistic time and man-power allocation *(Tool 8 - Plan of operation, Tool 9 - Roles and responsibilities)* *(Case Example 7)*. The design of the activity plan should be parallel to the other tasks of this *Module 2.1* and coordinated with the lead. *Checklist 9* suggests the important topics that have to be considered in the plan of operation at this stage.

Checklist 9 Topics to be considered in a plan of operation

Area	Important topic
Organisation of the process	☑ The description of the profiles of the technical team needed for the CaDRE and their selection, considering the necessary administrative procedures. ☑ Possible training for conducting interviews for the technical team. ☑ Design of the CaDRE process.
Content work	☑ Data gathering – interviews, surveys, additional research and documentation (each interview needs at least half a day of preparation and follow- up). ☑ Refinement of the Target Model and stakeholder assessments. ☑ Analysis of the information of the sectors and levels of concern and synthesis of the capacity needs. ☑ Elaboration of recommendations for a capacity development strategy.
Reporting, coordination and publication	☑ Report and presentation writing, correction and coordination of findings and feedback with stakeholders. ☑ Coordination with lead and key stakeholders – the decision-making body. ☑ Planned workshops and review meetings (as part of the stakeholder dialogue). ☑ Communication and publication of the CaDRE results. ☑ Milestones for interim and final reports – for *Step II (diagnostic step)* and *Step III (review and recommendations)*.

Case Example 7 Requirements for a full, qualitative CaDRE on renewable energy supply in Afghanistan (focus on the national level and one province)

- Planning and organisation – one week
- data collection (interviews, their first analysis, reading and understanding of reports and two research papers) – three weeks, two people
- draft of a Target Model renewable energy sector – two weeks, two people
- extraction of capacity needs – one week, two people
- synthesis and recommendations – three weeks, two people
- report writing (incl. presentations for workshops) – three weeks, two people
- workshops and coordination meetings – two weeks, two people.

Total about 30 weeks

Source: GTZ-ESRA, 2009

Module 2.2 – Capacity needs data collection

Lead / owner	The technical coordinator, supported by the lead.
Timeframe	Four weeks to several months (depending on the size of the CaDRE).
Information and documents already available	- The revised Target Model - the relevant stakeholders.
Results	All data and information required for the CaDRE is compiled and prepared for further analysis of the capacity needs.

A crucial step is to work out from which starting point the CaDRE shall be conducted. This has an effect on the type and level of detail of the information required and depends on the typo of CaDRE (full, partial, quantitative or qualitative) and the capacity level concerned.

The CaDRE could be, for example, exclusively focused on finding capacity development needs within a single institution that operates in the solar energy sector. In that case, capacity gaps at the system level may have an influence on the institution's performance but improving all these system capacities might be beyond the institution's power of influence or require too great an effort to be addressed.

The boxes show examples of questions from a full, qualitative CaDRE on renewable energy supply in Afghanistan GTZ-ESRA (2009).

1. Questions for a CaDRE with the improvement of framework conditions as its main goal.

Questions to be asked include:

At system level:

- What political and legal framework conditions are necessary to ensure the ministry is able to develop and update the strategy efficiently and the sector coordination for wind and/or solar energy supply can operate efficiently?
- What framework, agreements, legislation is needed for the institutional setup to update and enforce the strategy? What framework conditions get in the way?

At organisational level:

- Who is responsible for the implementation und update of the provincial electrification concept and provincial development plan in the wind and/or solar energy sector, and which planning procedures have to be set up for this?
- What organisational structures, processes, rules etc. are needed to plan, construct, manage and operate wind and/or solar power stations?

2. Questions for a CaDRE with the main goal of strengthening one or more organisations and their network and working conditions.

Questions to be asked may be:

At system level:

- Are there incentive mechanisms for renewable energy education in place?

At organisational level:

- What organisational structures, processes and rules are needed to plan, construct, manage and operate wind and/or solar power stations?
- With what organisations should the private design and construction companies establish coordination, co-production or knowledge management networks?

At individual level:

- What kind of technical and administrative key skills (knowledge, experience, modes of behaviour) are needed for planning, designing, constructing, managing and operating wind and/or solar power stations?
- Which of these key skills are available and which need new staff?

3. Questions for a CaDRE focused on education and training of individuals.

Questions to be asked include:

At systems level:

- What are the national goals, strategies and plans for a national and provincial energy supply concept?
- What are the incentives for renewable energy and the procedures to use them?

At organisational level:

- Is the renewable energy department operating under the right conditions to carry out its mandate (e.g. political support, financial resources, committed CEO)?
- Who is responsible in the provinces for the implementation and update of the provincial electrification concept and provincial development plan in the energy sector?
- Which planning procedures have to be set up for this?

At individual level:

- Does the renewable energy department have staff with the required skills?
- Are the working conditions favourable – what are the problems and challenges?
- Is staff training in place?
- What is the current flow of newly trained people available to be recruited?

Please note: The data collection is an iterative process. One interview or survey or one research study can reveal new aspects and promising information sources. This has two main consequences for the work of the technical team:

1. A well-structured knowledge base and internal coordination are needed to cope with the cascade of information.
2. Care should be taken to keep data collection to a manageable level of detail in order not to lose sight of the main CaDRE objectives.
3. Adaptation of the data acquisition methodology might be required during the process because new questions, underestimated interrelationships between stakeholders or processes will emerge.

Task sequence Data collection

Task	Description	Main results
14. Preparation and completion of interviews	- Identify interviewees - formulate key questions for each interview, prepare interview lines, test the interview - make appointments, conduct interviews - document. *Checklist 10 – General hints and tips on how to structure interviews* *Tool 13 – Interview*	The interviews have been conducted, well documented and prepared for analysis.
15. Preparation and operation of surveys	- Identify who should be surveyed - design and test questionnaires - send questionnaires - create an overview of answers provided to facilitate the analysis. *Checklist 11 – General hints and tips for questionnaires and surveys* *Tool 14 – Questionnaire*	The results of the survey are documented and prepared for further analysis.
16. Performance analysis	Collect information from experts of selected sectors or institutions on the performance of organisations or processes by conducting one or more performance analyses. *Tool 15 – Performance analysis*	Results of the performance analyses are documented and prepared for further study.
17. Collection and completion of special research studies	There may be a need for more information, for instance for certain topics that have moved into focus during scoping or have a higher degree of complexity (e.g. impacts of solar energy deployment on the labour market). Some of this information might be readily available; some information (especially for quantitative analyses) might require its own research. *Checklist 12 – Possible research and studies for detailed information collection* *Tool 16 – Modelling future employment*	Additional (research) studies are available and ready for further analysis and synthesis.
References to other sections	Data collection is prepared in *Module 2.1*. How to analyse the data to identify capacity gaps is explained in *Module 2.3*.	

Important comments

New issues need careful consideration because they may go beyond the previously agreed scope of the CaDRE. Since they are likely to have an influence on time and budget, close coordination with the lead and approval is required.

Task 14 – Preparation and completion of interviews

Tool 13 - Interview

Key questions

- Which organisations and experts should be included in the interviews? Who is the contact/interviewee?
- What are the questions to ask in each interview: what do we want to know from the interviewees about their work, institution, system, staff, ideas and concerns?
- How should the interview be structured?
- What has to be documented?

Be aware of expectations!
CaDRE will bring out capacity gaps that it might not be entirely possible to address in the resulting capacity development strategy. Expectation management is therefore an important task for the CaDRE team.

Interviews are fruitful sources of information because they are interactive and allow to obtain informal knowledge linked to formal knowledge. They can at the same time provide information about existing and necessary conditions of the system, the organisations, the individuals and the networking of the organisations concerned.

Apart from providing important information for the CaDRE, interviews can contribute to awareness among stakeholders about possible needs for change.

Information gathered during the interviews might reveal the necessity to interview further stakeholders. If that is the case, prepare and hold interviews as described for these stakeholders as well.

Suggestions for the working steps are listed in *Checklist 10*. More guidance material can be found in *Tool 13 - Interview*.

Checklist 10 General hints and tips on how to structure interviews

Area	Important topic
Before the interview	☑ Set priorities for the institutions/experts to be interviewed. ☑ Formulate key questions for each interview, based on the positions of the interviewee (minister, secretary, director, operational staff etc.) and the characterisation of the institution/organisation/enterprise – using the Target Model and the stakeholder description. ☑ Prepare interview lines with key questions. ☑ Prepare a format for interview reports including background information on the interviewee and organisation. ☑ Each interview should, in principle, consider all dimensions (policy framework, mandate, institutional structure and processes and working and decision making conditions, staff hierarchy, networks, problems and gaps and future perspectives). During the interview, some may turn out to be not relevant – but the interviewer has to be prepared for it. ☑ Prepare an introductory statement to be able to explain why the interview is taking place. Include a short presentation on why you have come and, what you want (background on the CaDRE and its objectives and expected results). Point out the benefit for to the institution. ☑ Make appointments for interviews. ☑ Train interviewers and test the interview to see if it works. If more interviewers are involved, this ensures a certain level of standardisation.
Conducting the interview	☑ Conduct each interview, making sure to document all answers well. The assignment of two people is strongly recommended, one to ask the questions and hold the interview and the other to take notes. ☑ Always ask for concrete data (figures, concepts, names and references) and try to get additional information like reports, organograms and tables in digital or hard copy. ☑ The best interviews are followed by an open conversation that allows one to obtain informal information.
After the interview	☑ The interviews should be transferred into clean text (interview report) and the first analysis should be done on the same day of the interview. Formal and informal information obtained should be documented separately and marked clearly. ☑ Ideas and suggestions emerging during the interview and analysis are documented in separate paragraphs. ☑ Collected, related material should be added in the annex. *Module 2.3. – Task 18 – Analysis of interviews, documents and surveys* is necessary to complete this step.
Asses the time	Rule of thumb: a two hour interview needs one hour of preparation and three to four hours of documentation. Use tables as suggested in *Tool 13 – Interview*.

Please note: The interviewer's role is to listen and not to judge. His/her role during an interview is to understand how the organisation views itself and its environment and not to interfere with recommendations about how it could function more effectively.

Task 15 – Preparation and operation of surveys

Tool 14 - Questionnaire

Key questions

Surveys are a standardised approach. The questionnaires are either sent to the defined target group or they can be used during interviews, where the interviewer poses the preset questions and fills in the questionnaire together with the interviewee.

Checklist 11 General hints and tips for questionnaires and surveys

Area	Important topic
Preparation of a survey	☑ Set priorities for the institutions/experts to be included in the survey. ☑ Formulate, as clearly as possible, what information is desired and translate it into questions to be asked. Try to use multiple choice and/or ranking questions as much as possible. ☑ If possible, try to include all dimensions (policy framework, mandate, institutional structure and processes and working and decision making conditions, staff pattern, networks, problems and gaps and future perspectives. ☑ Prepare questionnaires. ☑ Prepare an introductory statement to explain the purpose of the survey (background of the CaDRE and its objectives and expected results). Point out the benefit for the institution. ☑ Test with people that are not from the technical team. Check if the questions are precise and easy to answer. ☑ Test the survey.
Conducting the survey	☑ Send the questionnaire to the target groups. Set a deadline. Check by mail or phone and motivate respondents to send it back. ☑ Add a request to specify and send documents with background explanatory information.
After the survey	☑ Process the returned questionnaires for analysis. More details in *Module 2.3, Task 18 – Analysis of interviews, documents and surveys*.
Asses the time	Rule of thumb: preparation of a good questionnaire and tests is not easy. Careful preparation and testing may take one to three days.

Task 16 – Performance analysis

Tool 15 – Performance analysis

Key questions

- Who has the profile and knowledge about local organisations in the wind and/or solar energy sector to make a performance analysis?
- In which work area/task of an organisational unit or institution is the perceived capacity deficit highest; which is most badly in need of development?
- Which organisational unit or institution has the largest perceived overall need for capacity development?

A performance analysis is an external expert's estimate of the ability of an institution or organisational unit to carry out tasks such as planning, coordination, supervision or any other responsibility. For defined organisational areas, scores can be given for actual and required performance. The difference between actual performance and required performance – the capacity gap – is visualised.

The tool is very flexible. It can be used to get an overview of the performance of institutions (e.g. planning capacity, service delivery, coordination with stakeholders etc.) and can also be applied to assess the performance of individuals or groups of individuals in terms of their tasks, such as management ability, professional work, technical competencies, office organisation, behaviour, output etc.

If several experts are included in the analysis, their answers are processed jointly. This buffers individual expert preferences and provides a realistic picture of capacity needs.

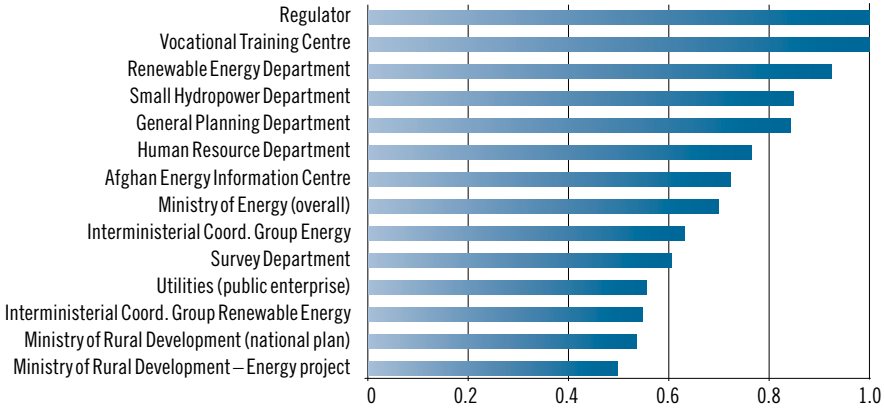
The results of the performance analysis are as follows: The capacity needs are identified for the organisational units (which unit has the largest overall need for capacity development?) and also in relation to their tasks (in which area is the capacity deficit highest? which area has the biggest need for capacity development?).

Case Example 8 shows the results of a performance analysis for the renewable energy sector in Afghanistan. More guidance material can be found in *Tool 15 – Performance analysis*.

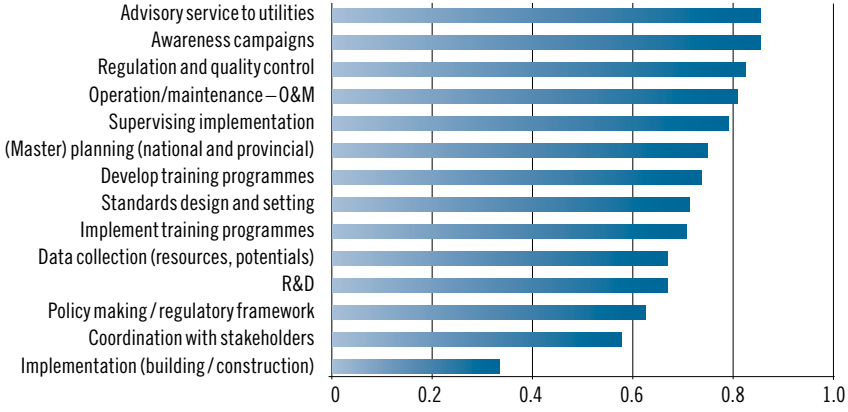
Case Example 8 Performance of national level institutions for renewable energy in Afghanistan (GTZ-ESRA 2009)

The closer the value gets to the maximum value of 1, the higher the need for capacity development activities. This is based on the estimates of six experts.

Capacity development required for the national level for the following organisational units



Capacity development required for the national level in the following areas



Task 17 – Collection and completion of special research studies

Tool 16 - Modelling future employment

Key questions

- What kind of special research could be useful and necessary?
- Is the added value of the information from additional research high enough to justify the effort?
- Are there alternatives to starting a research study?

Special (research) studies are an important source of background information for the assessment of special areas.

First there is a need to assess whether documents and data already exist in the country or region. Often - despite the background work in the scoping study and involvement of key stakeholders in the CaDRE process - the technical team stumbles on new issues during interviews, workshops or other meetings when discussing concrete questions. If there are no documents or data available or their amount and quality is not sufficient it might be necessary to generate them.

Special research studies normally require clear objectives and key questions, which have to be formulated, budgeted and approved. A thorough consideration of alternatives is therefore required. Can the information be unearthed during interviews or surveys? Have any existing international studies been missed?

Please note that quantitative studies require a lot of time and could be costly. Suggestions on key areas and bottlenecks often encountered are given in *Checklist 12*. The effects of renewable energy production on the national employment market are especially important *(see Case Example 9)*. These have an effect on demand for capacity development.

Case Example 9 Job creation and employment impact of renewable energy

The renewable energy sector can have a substantial net direct and indirect impact on employment.

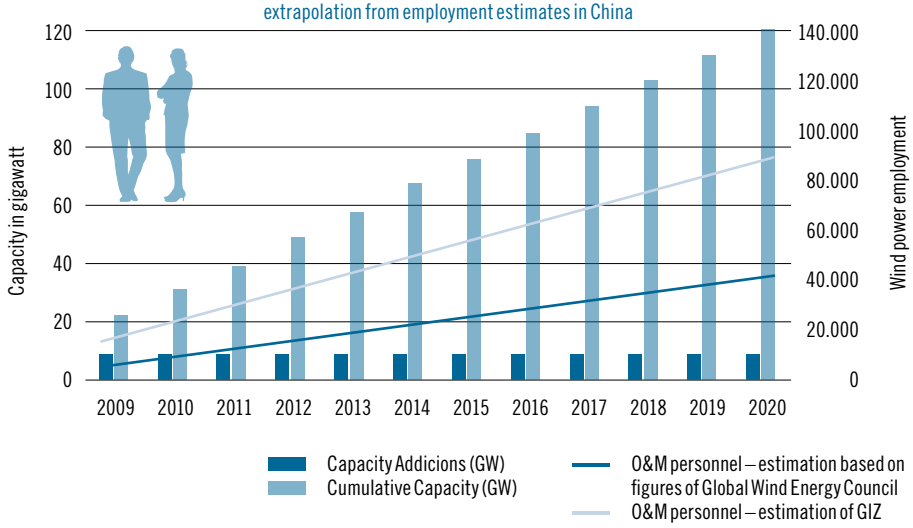
The direct impacts are the jobs created through renewable energy deployment, covering the different stages of the technology value chain: manufacturing, construction and installation, operation and maintenance, not counting jobs created in the support industries. The indirect impacts are the jobs created in support industries like construction materials, road building, standard technical equipment and tools. Additionally there are induced impacts, jobs in industries that benefit from consumption expenditure by employees in direct or indirect industries as more income allows increased consumption.

Intensive research is required in order to quantify employment impacts and estimate the need for individual capacity development. However, this research provides important background for elaborating capacity development strategies and plays a significant role in the development of national policies for the deployment of wind and solar energy. The obtained information can be used to assess the required capacity of the educational system (universities and training offers, existing degrees and curricula, teaching staff) to provide the sector with the required human resources in terms of qualification and quantity.

A number of efforts have been made over the last few years to work out reasonable employment projections *(see: Rutowitz and Atherton 2009, Wei et al. 2010, Breitschopf et al. 2012, DTI 2004, Singh and Fehrs 2001, Lehr et al.. 2012)*

Source: GIZ, 2011a

Example of O&M employment growth for wind power generation – extrapolation from employment estimates in China



A quantitative assessment tool is described in the *Toolbox (see Tool 16 – Modelling future employment).*

Source: GTZ, 2008

Checklist 12 Possible research and studies for detailed information collection

Core area	Possible research topics
Policy formulation	☑ Long-term energy mix scenarios and strategy (also as reality check for formulated policy objectives) ☑ non-economic or administrative barriers holding back the development of wind and/or solar energy systems ☑ links to other sector policies relevant for solar and wind energy e.g. employment, industrial, innovation and technology, R&D, environmental and climate change policies ☑ public reform processes and their relevance for the wind and/or solar energy sector.
Legal framework	☑ The legal and regulatory framework for renewable energy – access to the distribution and transmission system and electricity market, authorisation, licensing, environmental impact assessment ☑ import regulations and duties for technical equipment and tax structure (qualitative or quantitative).
Implementation strategy	☑ Potential of the CDM market (qualitative or quantitative) ☑ potential for NAMAs ☑ comparative study of renewable energy strategies in similar national conditions.
Support mechanisms	☑ National financing programmes ☑ feed-in tariffs and their regulation (qualitative/quantitative) ☑ import regulations for technical equipment and tax structure (qualitative or quantitative).
Wind and/or solar resource potential	☑ Quantity, quality and suitability ☑ identification of potential project sites (quantitative).
Quality infrastructure (technical standards and controlling quality of electricity service)	☑ Technical standards relevant for wind and/or solar energy systems (qualitative) ☑ evaluation of the regulator with reference to the renewable energy market (qualitative or quantitative).
Energy planning (regional, national, provincial)	☑ Procedures for land use planning ☑ energy planning for wind and solar installations ☑ the planning system for renewable energy – site selection and approval procedures installations ☑ analysis of national and local energy demand and supply (quantitative) – baseline studies (quantitative).
Technology production	☑ Overview of local manufacturers and their technical capacities (qualitative or quantitative) ☑ individual capacities required and available in quantitative (how many, by when?) as well as qualitative (skill profiles) terms.
Education and human resource development – training and education system (providers)	☑ Availability and suitability of technical and vocational training and educational supply (qualitative or quantitative) ☑ comparative study of the curriculum for renewable energy engineers, technicians and/or operators and their job potential (qualitative or quantitative).
Research and development	☑ Research institutions, their research capacities, focus and cooperation (qualitative or quantitative).

Core area	Possible research topics
Job creation and employment impact of renewable energies *(see Case Example 9)*	☑ Employment structure for wind and/or solar energy *(see Tool 16 – Modelling future employment)* (quantitative).
Construction	☑ Local enterprises able to build wind and/or solar energy plants and grids – potentials, (qualitative or quantitative).
Operation and maintenance	☑ The feasibility of different operation systems with respect to wind and/or solar energy for project owners (private, public, leasing models, PPPs, BOOT etc.) (qualitative or quantitative) ☑ the availability of skilled labour to ensure maintenance of solar and wind plants.
Grid infrastructure, grid integration of electricity from renewable sources	☑ Capacities and/or stability of grid systems and their suitability for integrating wind and/or solar power (quantitative and qualitative).
Electricity users – demand	☑ Cultural context and acceptance of renewable energy (qualitative) ☑ perceptions of communally managed utilities (qualitative or quantitative).

Module 2.3 – Capacity needs analysis

Lead / owner	The technical coordinator, supported by the lead.
Timeframe	Two to four weeks.
Information and documents already available	- Interviews, surveys and/or performance analyses - special reports, research studies, publications, background literature - an upgraded Target Model.
Results	The information gathered with respect to existing and lacking capacities for the system, the institutional and the individual levels and their networks is extracted (in text and different variant of the Target Model).

This module has three main tasks. All information collected should first be checked then filtered and evaluated according to its usefulness. All analyses should be done keeping the three capacity levels of the CaDRE (system, the institutional and the individual level) in mind.

1. The interviews are summarised individually in an interview report, according to a predefined scheme (examples *see in Tool 13 - Interview*) to filter and structure the collected information.
2. The information extracted from surveys, performance analyses and documents (research papers etc.) has to be condensed into the information required for the CaDRE.
3. The information is organised into a comprehensive scheme to facilitate the synthesis.

These tasks are best done in parallel with the data collection process i.e. *Modules 2.2* and *2.3*. This material is often very diverse and sometimes inconsistent or even contradictory. The management of this wealth of data will depend on the quality and professionalism of the technical team and technical coordinator.

Task sequence Needs analysis

Task	Description	Main results
18. Analysis of interviews, documents and surveys	Analyse the information gathered from interviews/surveys, studies and reports and the performance analyses using the Target Model to structure it. *Checklist 13 – Suggestion for contents of analytical interview report* *Checklist 14 – Suggestions on how to arrange capacities, capacity gaps and plans/ideas* *Tool 13 – Interview* *Tool 14 – Questionnaire*	The findings are structured and available to be used in future steps.
19. Extracting existing and lacking capacities	Available capacities are compared with expressed capacity needs to extract lacking capacities. The levels of system, institutional and individual capacity needs are clearly distinguished. *Checklist 15 – Main general topics for extracting capacity needs* *Tool 6 – Target Model* *Tool 7.1 & 7.3 – Stakeholder landscape and description* *Tool 7.4 – Governance map and relationships* *Tool 11 – SWOT analysis* *Tool 15 – Performance analysis* *Tool 17 – Rules of the game* *Tool 18 – Selection of work processes relevant for the performance of an organisation* *Tool 19 – Individual competence profile* *Tool 20 – Individual competence matrix*	An overview of existing and lacking capacities is available for the synthesis.
References to other sections	The results will be input into *Module 2.4* where a synthesis and recommendations are outlined.	

Important comments

The needs emerging from the comparison of existing capacities with required capacities in a Target Model need to be clearly differentiated. The first comparison might only give a limited view of the real capacity development needs. It might reveal capacity gaps that are e.g. outside the zone of influence of the entity leading the CaDRE. Both are valid, though, and should be discussed as part of an iterative approach, with the aim of finding the right balance for capacity needs that can and should be addressed in a future capacity development strategy.

Task 18 – Analysis of interviews, documents and surveys

Tool 13 - Interview
Tool 14 - Questionnaire

Key questions

- What are the existing capacities and the capacity gaps of the system, the institutional and the individual level from the interviewees' perspective?
- Can the interviewee provide any further formal and informal information about factors that will influence the future development of the wind?

The information gathered in interviews and surveys will be used to complete the Target Model and the stakeholder descriptions.

Interviews frequently do not just provide facts but also indications of internal conditions, fears, perspectives and the cultural context that may be important for evaluating the existing situation and potential of future developments.

A report should be prepared for each interview or group of interviews. *Checklist 13* is a suggestion for an analytical interview report.

Surveys/questionnaires: The way to analyse a survey depends on the type of questions and is part of the questionnaire design so no general rubric has been provided.

Research studies or other additional documents: The way to analyse research studies depends on the type of data and data needed so no general rubric has been provided here either.

Checklist 14 suggests how the results of the data relating to the capacity needs can be structured.

Checklist 13 Suggestion for contents of analytical interview report

It is advisable to compile the information for the interview report right after the interview. Interviews from closely related topics and/or institutions should be assembled in one interview report *(see also Checklist 10 in Module 2.2.)*
1. Working context of the organisation. 2. Mandates, responsibilities. 3. Organisational structure, staff hierarchy. 4. Activities.
5. Existing capacities, capacity gaps and plans/ideas how to overcome them – in terms of: - system conditions (work conditions, mandate, legal setting, economic and socio-cultural conditions, competition etc.), networks (such as competition, cooperation networks, associations and partners), internal structure and processes, value chains - staff and performance.
6. Interviewer comments concerning reliability of the information, reference to other information available from other sources/ people, background knowledge, surveys, reports and research papers, evaluation of the interviewee about other persons and institutions.
7. Documents collected.
8. Information still missing like new contacts or the need for more interviews (within the same organisation or additional ones). Alter the list of required information *(Module 2.1 – Task 12 – Identify missing information)*.
9. Ideas coming out of the interview.
Please note: For each two hour interview, allow about four hours for summarising and analysing it.

Checklist 14 Suggestions on how to arrange capacities, capacity gaps and plans/ideas

Area	Description of status, processes and conditions	Existing capacities	Needs, deficits	Perspectives
Examples of lead questions	What are the mandates, responsibilities, tasks or activities?	What are the available capacities for the responsibilities, tasks and activities?	What are the deficits and problems? What is lacking and why?	How can they be improved? What are the conditions for improvement?
System: policy and legal framework and context	☑ What are the political and legal framework conditions? ☑ How can they be characterised in terms of their network, their work processes, formal and informal structures and resources?			
Organisation: organisational capacities	☑ External relations and cooperation ☑ formal and informal structures, decision making (incl. management and administration) and cultures ☑ monitoring system ☑ staff hierarchy, organograms.			
Networking, cooperation and coordination	☑ Cooperation (including knowledge management) networks. ☑ use of synergies.			
Individual: human resources	☑ Managerial and technical competencies ☑ interpersonal capacities e.g. communication, teamwork and conflict management.			

Task 19 – Extracting existing and lacking capacities

Tool 6 - Target Model
Tool 7.1 & 7.3 - Stakeholder landscape and description
Tool 7.4 - Governance map and relationships
Tool 11 - SWOT analysis
Tool 15 - Performance analysis
Tool 17 - Rules of the game
Tool 18 - Selection of work processes relevant for the performance of an organisation
Tool 19 - Individual competence profile
Tool 20 - Individual competence matrix

Key questions

- What capacities are available?
- What capacities are lacking according to interviewees and/or surveyed people/organisations and what capacities are lacking according to expert knowledge (*from Tool 15 – Performance analysis*)?
- What is the political and market context, perspectives and trends of the wind and/or solar energy sector (or in the core area and related institutions or processes analysed)?
- Are networking options fully used?

Key issues to consider:

1. System conditions (mandate, legal setting, strategies, socio cultural conditions, competition, working conditions and market development).
2. Organisational capacities – internal structure and processes, including decision making and supply chains.
3. Individual capacities – staff hierarchy, behaviour and attitudes, knowledge and skills levels and performance.
4. Networking capacities – structures and functioning of networks.

This information should now be integrated into the Target Model. *Checklist 15* provides some ideas concerning crucial topics that should be kept in mind at each level as capacity needs are extracted. The following sections of this module suggest a series of tools that will help to summarise the conditions, the context of the existing capacities and the analysed capacity needs. The list of applicable tools is very long and the CaDRE team needs to decide which tools are the most appropriate ones to be used within the analysed scope.

Checklist 15 Main general topics for extracting capacity needs

Dimension	Topics of concern
System level	☑ Policy and strategy decisions (incl. feed in tariffs, market policy, education and human resource development) ☑ processes and their legal/regulatory base ☑ institutional structure and policy (new institutions, mandates etc.) ☑ financing and budgeting (incl. feed in tariffs, market policy) ☑ market structure ☑ grid system and access.
Organisation level	☑ Mandates and organisation ☑ strengths, weaknesses, perspectives in terms of institutional origination and structure, staff hierarchy and managerial and working conditions, position and role of the institution in the system ☑ networking and advocacy ☑ deficits in institutional awareness ☑ production processes, supply and value chains.
Individual level	☑ Deficits in awareness, knowledge and skills ☑ lack of motivation and commitment (behaviour and attitudes). The individual level capacities are mostly closely linked to the institution/organisation/enterprise.

System level

Four steps are suggested to extract system level capacity needs:

1. Summarise the contextual factors e.g.
   a) history of renewable and conventional energy supply
   b) policy and politics
   c) economic structure
   d) society and demography
   e) cultural traditions
   f) geography and resource endowment that can influence institutions
   g) type of prevailing governance mechanism
   h) education
   i) research and development
   j) state of technology
   k) media
   l) finances
   m) donor relationships and other aspects.
2. This thereby completes the picture of organisations, people and structures as key elements as well as their interconnected relationships (*Tool 17 – Rules of the game*).
3. Extract relevant trends in social, technological, economic, environmental and political factors and their influence on the wind and/or solar energy sector.
4. Characterise the capacities required and in place in relation to institutions that have governance functions in the institutional setup (*Tool 7.4 – Governance map and relationships*).

5. Use the findings on existing and lacking capacities from the analysis of interviews, surveys, performance analysis and individual studies and reports to summarise capacity gaps at the systems level *(Tool 6 – Target Model)*.

Organisational level

Five steps are suggested to extract the organisational level capacity needs. Depending on the scope of the CaDRE, points two and three below may not be necessary:

1. Refine the stakeholder description using the information collected from *Module 2.2 (Tools 7.1 & 7.3 – Stakeholder landscape and description)*.
2. Get an overview of the *financial, customer, process* and *employee* related performance and perspective (proportion of administrative costs, operational measures, quality measures etc.) using the interview reports and performance analysis *(Tool 15 – Performance analysis)*.
3. For selected core organisations: Get an overview of how well-geared an organisation is to perform successfully in the wind and solar energy sector in terms of its position in the system, its clarity and ability to carry out its mandate, its management capabilities, resource availability, cultural health, the functionality of its structures and internal processes and quality of its products. A SWOT analysis of the institutions may underpin this check *(Tool 11 – SWOT analysis)*.
4. Identify and classify work processes in selected organisations/units that most influence its performance with respect to wind and/or solar energy. This step is necessary for the capacity needs identification at the individual level *(Tool 18 – Selection of work processes relevant for the performance of an organisation)*.

Individual level

Three steps are suggested to extract the capacity needs at the individual level:

1. Determine the most relevant work processes within an organisation with the help of *Tool 18 – Selection of work processes relevant for the performance of an organisation*.
2. Identify for each selected work process the task-related competence requirements with the help of the *Tool 19 – Individual competence profile*.
3. Identify the existing capacities and capacity gaps at the individual level making reference to the skills requirements *(Tool 20 – Individual competence matrix)*.

Results summarised and structured in a short form are advised, using a table as in *Checklist 4 – Basic Target Model*. The report should use info-graphs from tools used.

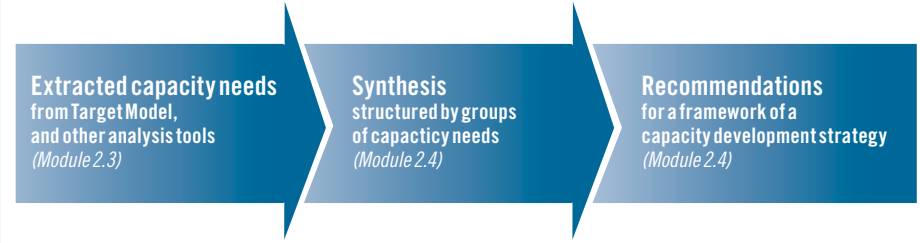
Please note that the table can become quite large. The table can be split or reformatted for better readability.

Module 2.4 – Capacity needs synthesis

Lead / owner	The technical coordinator, supported by the lead.
Timeframe	Two to four weeks.
Information and documents already available	- Interview reports - final draft of the Target Model - summary sheets of analysed information - info-graphs and explanatory text of analysis tools.
Results	- The consolidated existing capacities and capacity needs are formulated in a report. - The report is presented to the lead and key stakeholders. - Initial recommendations for the framework of a balanced capacity development strategy are made as input to the decision making *Step III* of CaDRE.

A synthesis of the results of *Module 2.3* has the following advantages for *Step III*:

Figure 3.3 From extracted capacity needs to recommendations



Task sequence Synthesis and recommendations

Task	Description	Main results
20. Make a synthesis and recommendations and draft final report	The final diagnostics report consolidates the background information of the wind and/or solar sector and concentrates the results for the scope of the diagnostics including initial recommendations for a capacity development strategy. *Checklist 16 – Synthesis in tabular format* *Checklist 17 – Suggested outline for the final CaDRE report* *Tool 4 – Report guidelines* *Tool 21 – Interrelationship analysis*	The results of CaDRE *Step II* are consolidated and a draft report is available for discussion.
References to other sections	The consolidated results are the input for the CaDRE review and recommendations step.	

Important comments

An extensive CaDRE will produce a rather large amount of information, especially when it covers the whole wind and/or solar energy system from policy level to delivery and use of regenerative electricity. It is worth considering producing one main summary report and separate individual reports focusing on particular issues.

Task 20 – Make a synthesis and recommendations and draft final report

Tool 4 - Report guidelines
Tool 21 - Interrelationship analysis

Key results

- The results of the CaDRE are compiled in a report.
- The most important results for the design of a capacity development strategy are highlighted and visualised.

The synthesis

The latest version of the Target Model is the starting point for the synthesis *(example Checklist 4 and Table 2-2)*. Suggestions for the synthesis include:

1. A summary of the different capacity needs for one core area, subdivided according to relevant topics and/or processes. Give a short description of the resulting gap complex (formulated as problems to be addressed). This part will be the heading for one section of the synthesis.
2. Formulate consolidated gaps for each level (system, organisational, networking, and individual). If obvious, differentiate expressed subjective needs from the more objective needs based on consolidated findings of the analysis and the Target Model.
3. Add recommendations to close the gaps (broad capacity development tasks).
4. Categorise the interventions in types, like strategy development, policy settings, legal activities, human resource development and research.

Please note that there can be quite a few tables. *Case Example 10* gives an example of a full CaDRE.

The use of *Tool 21 – Interrelationship analysis* is recommended, especially for more complex CaDREs. Ignoring the interactions between the system, organisational, network and individual levels leads to imbalances and weakens the capacity development process. For instance, if human resource development measures pay too little attention to people's working environment they are pointless. Organisational development that fails to take into account potential cooperation with other organisations might lead to a loss of real opportunities. The analyses will help to identify the deficits and risks that can emerge from the unbalanced development of capacities. They will prompt recommendations for the design of a balanced capacity development strategy.

Checklist 16 Synthesis in tabular format

Problem addressed: **Indicate below: core area, appliances & process and cap or gap complex.**		
Capacity gaps identified	Recommendations	Category of intervention
Consolidated gaps identified for the topic and/or process analysed. Include, if relevant, the possible connections to other core areas and topics.	Brief description and list of recommendations (be specific).	Categorise the interventions: - policy/structural - strategic - institutional development - human resources - etc.

The final report

The final report of the CaDRE should document all relevant results. It should include text, tables and info-graphs. Please note that for complex CaDREs a modular report is appropriate. *Checklist 17* is a suggested outline for a CaDRE report.

Case Example 10 Synthesis of capacity gaps and recommendations for capacity development (GTZ-ESRA 2009)

The example is only a small fragment of a larger document and addresses the role of *political priorities*

Main problem: The political priority for non-grid based, community driven rural electrification using renewable energy is low compared to centralised and grid-oriented electrification.

Identified capacity gaps	Recommendations	Intervention type
There is no policy or strategy for rural electrification through renewable energy technologies.	**Support the design of a rural electrification policy and strategy at national level.** Support the elaboration of a draft national strategy for rural electrification through renewable energy. The development of a joint strategy requires: - legal and institutional framework (clear mandates and responsibilities, implementation and regulations, incl. transition of decentralised small grids to larger ones - clear guidelines and rules for private sector participation and PPP regulations - standards and approval procedures and criteria for design and construction of power stations - organisation and rules/regulations for construction and equipment implementation – tendering procedures - regulation (tariffs and connection fees, enforcement of standards, conflict settlement procedures etc.) - financing arrangements (including the planning and supervision of the *Rural Energy Fund*) - etc.	Policy / structural. Conceptual.
Rural electrification is not of high importance at national level There is a lack of awareness of renewable energy, its potential and contribution to the rural development of Afghanistan.	**Awareness campaigns at the political and decision maker level.** - Run information and awareness campaigns and workshops for: - politicians - chambers, industry - technical colleges and training institution - universities - general public	Human resource development.

The example is the beginning of a two-page table addressing the problems at the national policy level (even from fields in the synthesis covering 16 pages for policy and institutional development and 13 pages for recommendations of the individual capacity development).

Checklist 17 Suggested outline for the final CaDRE report

No.	Main headline	Remarks
1./2.	**Executive summary. Background and aim of the mission.**	Including a short characterisation of the wind and/or solar energy sector and the scope and objectives of the CaDRE.
3.	**Methodology and deliverables.**	Brief summary including a guideline for separating reports and deliverables if required.
4.	**Framework conditions.**	This chapter outlines the framework conditions of the wind and/or solar energy sector with a focus on the areas of activity.
4.1	Natural, socio- economic and technological framework.	Natural resources and general economic context for wind and/or solar energy systems, maturity of the system, socio cultural conditions, working conditions in the country/region. Infrastructure of the renewable energy generation and supply system. Also include aspects of the business environment, corruption and other external factors of the context in focus that can have an influence on the solar and wind sector.
4.2	General policy situation (politics and policy), strengths and weaknesses/ gaps and potential, including human resources at individual level.	**System level:** - goals and strategies - legal setting - governance relationships.
4.3	Strategies, processes, planning and implementation – strengths and weaknesses/gaps and potential, including human resources at individual level.	Energy and/or production, supply chains, value chains, integration of renewable energy into the grid. Processes such as finance/budgeting, planning, legislation, logistics, production (value and process chains) and education.
4.4	Labour market for renewable energy.	Supply and demand for specialised solar and wind professionals and skilled labour in the country concerned. Trends.
4.5	The target institutions and organisations in the system.	Overview of the stakeholders in the system analysed and processes.
5.	**Institutions/organisations.**	This chapter explains in detail for each organisation analysed the context, conditions and existing capacities and capacity needs for each organisation analysed. It is important to assess the motivation and possibilities for change through a capacity development process.
5.1	Institution 1 - Mandate and responsibilities - organisational setup and capacities - strengths and weaknesses/gaps and potential (incl. human resources at individual level) - possible development trends and planned changes.	**Organisational level:** Characterisation of the organisation, strengths, weaknesses, status and connections in the system, perspectives and change processes, capacity gaps and conditions and motivation for change, staff hierarchy. **Individual level:** Existing capacities and capacity needs differentiated for different levels (managerial, operational, administrative), conditions and opportunities of change, motivation and opportunities.

No.	Main headline	Remarks
5.2	Institution 2 (…)	(…)
6.	**Synthesis of main problems, capacity gaps, challenges and recommendations.**	This chapter summarises the results of the CaDRE structured along main problems (incl. gap complexes).
6.1	Summary of main problems and challenges.	Overview, outlining the key areas that need interaction with justification and possibilities for a sustainable and balanced capacity development strategy.
6.2	Recommendations for systems development.	**System level:** Discussion and recommendations for addressing capacity needs such as strategy, new or adapted institutional setup, market conditions, legal and regulatory settings.
6.3	Recommendations for organisational and institutional development.	**Organisational level:** Discussion and recommendations for addressing capacity needs such as management structure, administrative efficiency, human resource management, costing structure etc.
6.4	Suggestions for a framework of capacity development measures (individual level).	**Individual level:** Discussion and recommendations for addressing individual capacity needs or people in the context of their work conditions and career prospects in the renewable energy market.
7.	Annexes.	The annexes should include all background material, such as the Target Model, background material of the analyses and other findings.
7.1	References and materials used.	
7.2	Lists of interviews and official meetings.	
	Further annexes.	

Step III – Review and recommendations

Step III
Review and recommendations

Module 3.1
Prioritisation of recommendations for a capacity development strategy

Module 3.2
The final CaDRE workshop

Purpose

After preparing a set of recommendations for possible capacity interventions, the CaDRE team supports decision-makers in choosing the possible core elements for a future capacity development strategy. Once a decision is made, relevant stakeholders are informed and the next steps towards elaborating a strategy are defined. This step consists of two modules:

- *Module 3.1* aims to translate the recommendations of the CaDRE into a framework to guide and facilitate the development of a capacity development strategy for the wind and/or solar sectors.
- *Module 3.2* gives suggestions for a final CaDRE workshop for the communication of results to relevant stakeholders and to work out next steps.

Close cooperation and coordination with decision-makers from key stakeholder groups is required to increase the likelihood of translating CaDRE into feasible, effective and sustainable capacity development strategies, programmes and measures. Comprehensive capacity development is barely possible without the establishment of strategic partnerships between the stakeholders in the solar and/or wind energy sectors.

The decision-making process will vary depending on the CaDRE focus and analytical depth, the type and conditions of the legal, organisational/administrative and decision-making procedures of the lead and the key stakeholders.

Before getting started, the CaDRE team should evaluate which of the proposed modules and tasks are useful and whether there is a need to apply additional tools or add further tasks to the process. CaDRE should to be fine-tuned to the specific context of analysis.

Result of Step III

- Capacity gaps will be confirmed and an agreement made on recommendations, priorities and approaches for the development of a framework for a capacity development strategy.
- The final CaDRE report is distributed to the key stakeholders and other interested groups such as civil society organisations.
- There is a decision on the next phase for strategy development.

Module 3.1 – Prioritisation of recommendations for a capacity development strategy

Lead / owner	The lead, supported by the technical coordinator.
Timeframe	One to three weeks.
Information and documents already available	- Draft CaDRE report - recommendations for a capacity development strategy.
Results	Recommendations for a capacity development strategy by the lead are summarised and prepared for communication to the relevant stakeholders.

Task sequence Suggestions for the input for a capacity development strategy

Task	Description	Main results
21. Characterise the areas concerned in a balanced intervention	The areas of possible intervention should be selected and prioritised, so that a balanced capacity development strategy can be created. *Checklist 18 – Check the draft recommendations* *Tool 12 – Zone of influence of organisations* *Tool 21 – Interrelationship analysis* *Tool 22 – Force field analysis* *Tool 23 – Interest & power to implement analysis*	Decision makers have prioritised intervention areas.
References to other sections	The recommendations and CaDRE report are communicated and a final workshop can be arranged. This is the main task of *Module 3.2*.	

Important comments

The challenge is to select a range of interventions for capacity development that avoids in the medium and long term possible capacity discrepancies. This generates balanced interventions. An imbalance in interventions occurs when more is invested in the development of one area of the sector than another (e.g. utilities are strengthened, but there is no qualified staff available for operation and maintenance; feed-in tariffs are set but there is no functioning regulatory authority).

Task 21 – Characterise the areas of balanced interventions

Tool 12 - Zone of influence of organisations
Tool 21 - Interrelationship analysis
Tool 22 - Force field analysis
Tool 23 - Interest & power to implement analysis

Key questions

- What are the capacity development priorities in relation to the wind and solar energy vision and targets?
- Which of the suggested interventions are suitable and feasible?
- What should a balanced intervention plan leading to sustainable capacity development look like?

The results of this module will be the main input for the final CaDRE workshop (*Module 3.2*). The collected and analysed capacity needs, as well as initial recommendations, have to be reorganised into packages of possible intervention options that anticipate the structure of a capacity development strategy and its implementation.

The aim is to give priority to the gap complexes and corresponding draft recommendations of the CaDRE report, with respect to the effort they require, their feasibility, their urgency, their interrelationships, their risks and possible synergies.

Checklist 18 specifies the main criteria for prioritisation. It is in any case a good idea to check whether decision-maker(s) have further criteria for assigning priorities that should be added to the list.

Please note

An imbalance in capacity measures can create a *cattle cycle*. This term describes the lack of something leading to increased supply while other measures lead to decreasing demand – so that a couple of years later, for example, a lot of unemployed specialists are available. Therefore the key is to keep interrelationships between capacity gaps in mind, rather than focusing on one particular problem.

The tools provided to underpin the characterisation are:

- *Tool 21 - Interrelationship analysis* to reach a common understanding on interdependencies between the individual, organisational and system level.
- *Tool 12 - Zone of influence of organisations* to understand interests, power and salience of key players in relation to goals and to identify the scope for change.
- *Tool 22 - Force field analysis* to prioritise recommendations collected during the CaDRE and to involve key stakeholders in change processes.
- *Tool 23 - Interest & power to implement analysis* to visualise the interest of the stakeholders in implementing the recommendations and their decision-making power to contribute. This helps to set planning priorities.

Checklist 18 Check the draft recommendations

Area	Considerations	Possible questions
Effort and feasibility	**Costs** of implementation.	Which capacity development measures are low cost and are included in existing budgets and which need additional financial resources?
	Required **time** for closing capacity gaps.	What can be done quickly and what needs more time?
	Potential or power to convince and **influence** other stakeholders.	Which institutions are bound by directives? Which processes can and which cannot be influenced directly?
	Resistance to change and divergent interests in capacity development.	What are the diverging interests of powers governing the sector or an organisation/enterprise? Which are favourable which are not?
	Need for clarity and information – **awareness** building.	Do decision-makers have the awareness and sufficient knowledge of wind and solar energy related issues?
Impact	Level of impact of different measures.	Which measures would be the most promising in terms of impact?
Urgency	**Most pressing** capacity needs.	What problems need to be solved most urgently?
	Minimum requirements for change.	What is an absolute necessity and what would it be nice to have?
Interdependencies	Necessary **sequence of change**.	Are there capacity gaps that can only be filled if others are filled first?
Risks of asymmetry	**Risks of imbalances** of capacity development on the systems at the organisational and individual level.	What interdependencies exist in the development of capacities at the systems, organisation and individual level? Risk of neglecting dimensions of capacity development. *See Tool 21 – Interrelationship analysis.*
	Risk of mismatch between different areas.	Is one area of the wind and solar energy system linked to another, leading to dysfunction if it develops independently?
Synergies	Programmes in other areas, governments, international partners or institutions that can positively or negatively influence the capacity development of the wind and solar energy sector.	Are there any other projects or market developments that support capacity development efforts? Can any initiatives be scaled up? Can favourable partnerships be built?

Module 3.2 – The final CaDRE workshop

Lead / owner	The lead, supported by the technical coordinator.
Timeframe	Up to two weeks.
Information and documents already available	- Final CaDRE report – incl. recommendations for possible interventions for a capacity development strategy - suggestions for areas for a balanced intervention.
Results	- Capacity gaps and needs are shared and approved. - Suggested recommendations for the framework of a capacity development strategy are agreed. - Commitments are made as to how to use the recommendations of the CaDRE to plan and implement a capacity development strategy. - Decisions are made concerning next steps towards the development of capacity development programmes.

Task sequence Final CaDRE workshop and laying the ground for the development of a capacity development strategy

Task	Description	Main results
22. Prepare the final CaDRE workshop	Relevant stakeholders are informed of the final result of the CaDRE. - Participants are selected and informed -agenda is prepared - methods and tools are chosen -logistics are planned. *Module 1.2 – Task 7 – Organisation of the scoping workshop –* *Checklist 6 – Preparation of the scoping workshop* *Tool 10 – Organising an efficient meeting or workshop* *Tool 25 – Communication plan*	The workshop is prepared. Stakeholders have confirmed attendance.
23. Conduct the final CaDRE workshop	A final workshop shares the findings with a broader audience with the aim of creating ownership and commitment. The workshop will discuss and should reach an agreement about the main cornerstones and procedures for starting a capacity development strategy.	The main findings of the CaDRE are discussed and shared with the key stakeholders. The next steps towards a balanced capacity development strategy are discussed and agreed.
24. Follow up	Summarise the workshop results, communicate the findings and plan the steps to design a capacity development strategy and its implementation. *Checklist 19 – Groups to be considered for the communication of CaDRE results* *Tool 25 – Communication plan*	All the results of the CaDRE are ready to be distributed to a wider target group and motivate key stakeholders to take actions.

Important comments

A rudimentary plan of the next step – the elaboration of a capacity development strategy – should already be available. There is always a risk that even quite a comprehensive and interactive study will end up at the back of drawers and bookshelves. There must be a commitment to translate the results of CaDRE into concrete capacity development measures. One option is to sign a Memorandum of Understanding (MoU) or at least a Letter of Intent (LoI) to achieve a more formal commitment.

Task 22 – Prepare the final CaDRE workshop

Tool 10 – Organising an efficient meeting or workshop
Tool 24 – Communication plan

Key questions

- What should be achieved in the final workshop? What needs to be decided? What level of commitment is expected from the key stakeholders?
- What and how should the results of the CaDRE be presented and discussed?
- What material has to be distributed, to whom and when?
- What should be the approach of the capacity development strategy workshop?

The preparation and organisation of the workshop has the same steps as the scoping workshop and is described in *Module 1.2* and *Checklist 6*.

The final workshop has four main objectives:

1. Presenting and discussing the final CaDRE report and the summarised suggestions for interventions with the key stakeholders.
2. Agreeing on the identified capacity development needs.
3. Presenting and discussing the viability of formulated recommendations for capacity development.
4. Planning, approving and coordinating the next steps and management of stakeholder expectations.

For each of these topics a presentation and other support materials have to be prepared. References to practical examples and best practices for possible intervention can facilitate the creation of a vision of the future capacities in the sector and help motivate stakeholders to commit to supporting the capacity development process.

Be sure the material is thoroughly prepared and discussed with the initiating agency and lead, key experts and the facilitator. Specific hints are compiled in the *Tool 10 – Organising an efficient meeting or workshop*.

The participants should be key stakeholders and experts who are directly affected by the recommended interventions and who have a vital interest in being active in the implementation of future capacity development programmes. These include:

- people with responsibility for implementation and/or control of the aspects assessed during the CaDRE
- politicians engaged in the (renewable) energy sector
- international/regional cooperation partners/donors that have already been or may be involved (for expert, logistical and/or financial capacity development support).

The draft CaDRE report with all annexes has to be distributed to all participants before the workshop.

Task 23 – Conduct the final CaDRE workshop

Key results

- A common understanding on capacity development needs has been established.
- A common agreement on the capacity development path has been reached.
- Key stakeholders are committed to contributing to the capacity development in the wind and/or solar energy sector.

Please note
The outcome of CaDRE is not meant to be the capacity development strategy itself. The aim is to display the various possible capacity development paths. There may have already been recommendations for concrete capacity measures. Nevertheless, decision makers should not be left with the impression that these measures are in themselves enough to reach their goals.

The final stakeholder workshop uses the consolidated final diagnostics report and the summarised suggestions for interventions as input for a capacity development strategy.

Main decisions/agreements

- Agreement on the identified capacity development needs and approval of the final CaDRE report.
- Agreement of the formulated recommendations for capacity development strategy.

- Next steps – outline and responsibilities (which organisation will be active in the strategy development, what time frame is feasible, who will take the lead or coordinate, what are the estimated costs).
- Memorandum of Understanding or Letter of Intent – if required – for the further development and implementation of the capacity development strategy.

The presentation and discussion should concentrate on:

- **perspectives and potential** of the wind and/or solar energy sector and the conditions underlying these perspectives
- **capacity gaps and needs** for the systems, organisational and individual level (including the working environment in key organisations, administrative weaknesses, institutional setup, finances and staff hierarchy and qualifications)
- different **capacity development paths**, highlighting:
  - urgency to address a certain capacity gap, as well as things that are a must or would be nice to have
  - effort required
  - feasibility
  - financial implications and possibilities
  - important interrelationships and interdependencies
  - risks of asymmetry in development
  - synergies with other projects, programmes and market developments but also between the stakeholders present at the workshop
  - advantages and disadvantages.

Visualisation of results

The visualisation of the recommendations and suggested capacity development paths is of high importance. The challenge is to produce memorable symbols (like slogans or info-graphs) to break down the complexity of issues but also to provide the information necessary for decision making.

Presentations and discussion in plenary sessions and in working groups are suitable methods. A moderator and rapporteur are strongly recommended.

Task 24 – Follow up

Tool 24 - Communication Plan

Key questions

- Who should be informed about the results of CaDRE?
- What is the best way/ channel to reach these target groups? Anything specific that has to be considered (e.g. language)?
- What material is needed?

The activities after the approval of the final CaDRE report and after the final workshop will formally close the CaDRE and precede the elaboration of a capacity development strategy.
The final steps include:

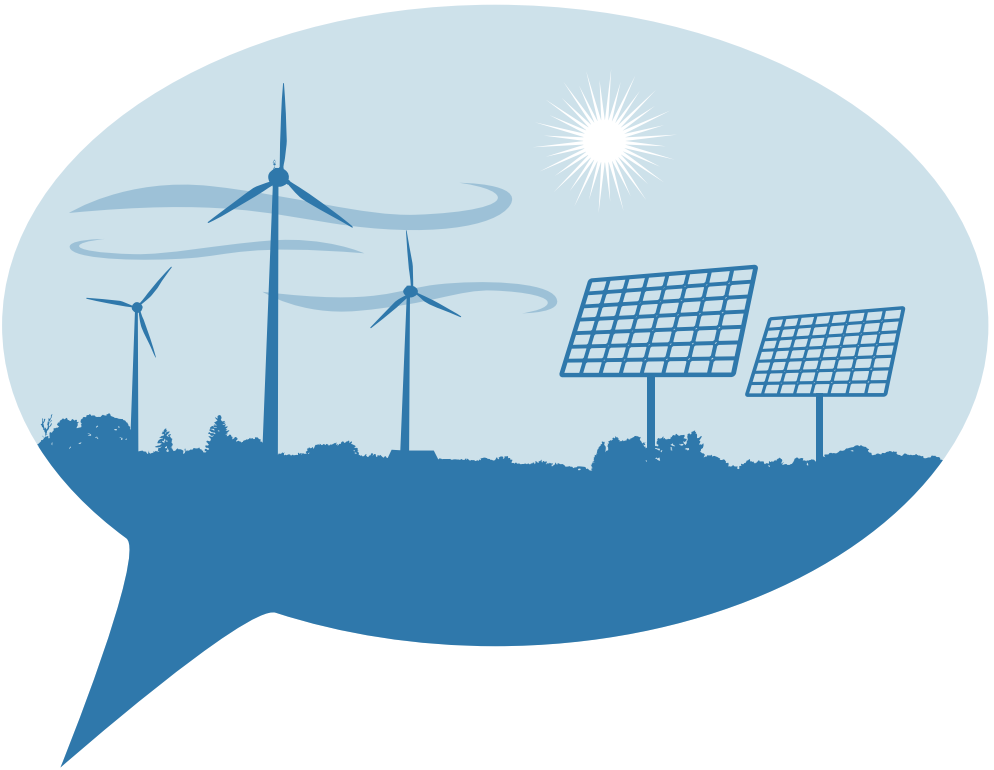
- a report and minutes of the workshop for participants and their organisations including decisions taken, an outline of next steps and responsibilities
- the final, **official CaDRE report** including extracts of sections that may be important to selected stakeholders and to its distribution
- the official report which **should be officially distributed to all stakeholders involved**
- a short **executive summary** to inform and motivate politicians and other decision-makers in organisations and institutions (including, if relevant, pressure groups, NGOs, industrial and/or professional associations)
- preparation of material and press releases for media (if required).

Checklist 19 characterises the groups that could be informed and indicates what kind of material is needed for this. The *Tool 24 - Communication plan* underpins the communication of results.

To give an idea of the use of CaDRE results after the diagnostics process has been completed, *Chapter 5 - General guidelines for capacity development strategies* outlines the core elements of capacity development strategies. *Chapter 6 - Best practice in capacity development for renewable energy* - provides examples of topics that play a prominent role when aiming at the sustainable development of solar and wind energy capacities.

Checklist 19 Groups to be considered for the communication of CaDRE results

Group	Description	Material needed
Key stakeholders (including participants in the final workshop) directly affected by CaDRE results.	Those already involved in the CaDRE and final workshop: - people/institutions with a major stake in and responsibilities for a capacity development strategy (design, support, implementations). - politicians engaged in or responsible for the (renewable) energy sector - the international cooperation partners/donors that have already been or may be involved (for expert, logistical and/or financial support of capacity development).	- Workshop reports/minutes incl. agreements and outline of next steps - the final official CaDRE report with all annexes - recommendations derived from the CaDRE - text blocks to be used by the group for announcements, websites, press releases and similar.
Stakeholders indirectly affected by CaDRE results.	Those not actively involved in the CaDRE (except for interviews and/or surveys): - associations (users, producers, suppliers) that represent interest groups - ministries/departments/agencies that have some role in renewable energy issues (control, planning, budget, administration, reform processes) - producers of technology - utilities, grid operators and providers - major civil society groups and NGOs concerned with renewable energies - consumer associations.	- Executive summary of the CaDRE report - summarised final workshop report, recommendations derived from the CaDRE - outline on how the stakeholders will benefit from the CaDRE results.
Key experts in the wind and/or solar energy sector.	Normally they have been already directly or indirectly involved in the CaDRE: - experts as representatives who were involved in the CaDRE are important contributors to all technical questions.	Summary of the CaDRE report. - If involved in the CaDRE the complete report, -recommendations derived from the CaDRE.
Media.	For wider communication and awareness building: - print and broadcasting media - specialist journalists - public relations officers at stakeholder organisations.	Press release (with background material – short version of the executive summary).



4

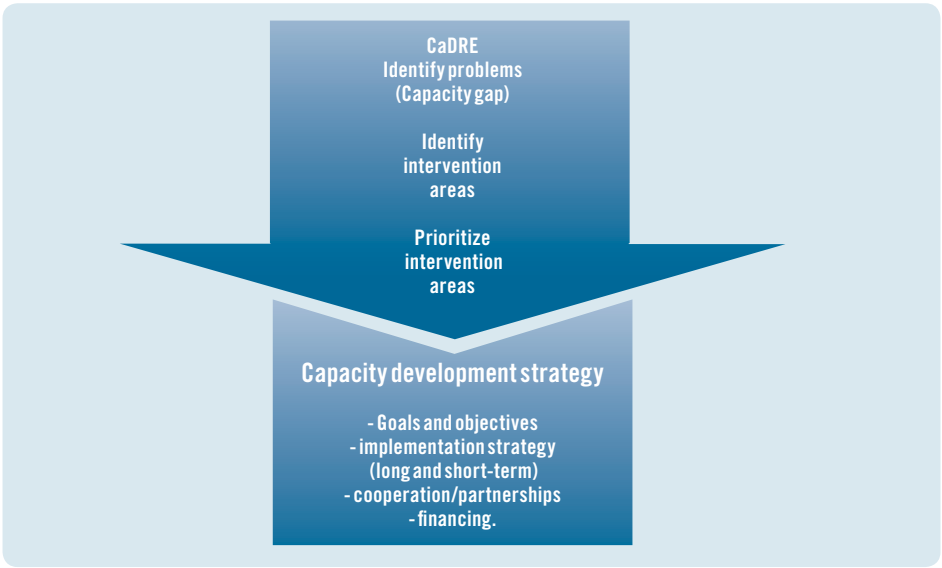
General guidelines for capacity development strategies

After the identification of the capacity development needs of a country, organisation and/or a group of people through CaDRE, a comprehensive capacity development strategy needs to be designed. The strategy consists of a vision for the future and concrete solutions to close the identified capacity gaps and generate the right conditions for solar and wind energy development.

The elaboration of a strategy is outside the scope of this *Handbook*. Nonetheless, the core elements of a capacity development strategy are outlined in this chapter. The following *Chapter 5* provides best practices and examples that could be useful when drafting a new strategy for solar and wind energy deployment. A capacity development strategy should include the following elements:

- Capacity development objectives – what will be accomplished and in which areas?
- Capacity development activities – what are the actions and activities to be taken forward to achieve the desired objectives?
- Implementation priorities – in what order will activities be implemented?
- Monitoring and evaluation – how can the progress and impact be tracked and evaluated? How will it be fed back to the decision makers, i.e. to consider a continuation of certain activities at a later point in time?
- Strategic partnerships and synergies – which existing structures/initiatives can be built on and who could act as strategic partners?
- Finance – what is the volume needed and what financing options are in place and/or required?

Figure 4.1 From CaDRE to a capacity development strategy for solar and wind energy



Capacity development objectives should be clearly formulated to address the capacity needs identified in the CaDRE. Capacity development is a change process which requires a high degree of effort and time. Objectives set should therefore be realistic and balanced.

For each development objective, **capacity development activities** need to be designed and planned. Some concrete interventions might have already been recommended during the CaDRE.

It is important to set short, medium and long-term goals especially when addressing the system level but also for organisational capacity development. Designing a strategy that consists only of long term goals might lead to frustration and loss of motivation among the stakeholders involved, as no tangible results will be visible for a long time. In the same way, concentrating on short term goals, which for instance do not address key organisational and system challenges, is ineffective.

It is equally important to prioritise capacity development objectives **(implementation priority)**. Criteria for giving particular objectives priority over others could include: time (how long it will take to close the capacity gap); effort (the number of obstacles that need to be removed to close the gap); urgency (how critical the demand is for a certain capacity); the cost-benefit relationship between the different intervention areas and the availability or absence of synergies.

The results and impacts of capacity development activities should be monitored and evaluated. For this purpose, **measurable** indicators for each objective and their corresponding activities are required. The Target Model elaborated in the CaDRE provides the baseline against which the results and impacts can be measured.

Strengthening and building new **strategic partnerships** for capacity development is a key success factor. Integrating the capacity development strategy to an existing national, regional and/or sector programme makes use of synergies, which can help push through change. This becomes even more important in countries where intentional (multi or bilateral) development partners are active and governments have to coordinate and streamline all development efforts. Last but not least, it is important to secure long term reliable finance.

5

Best practice in capacity development for renewable energy

Strengthen the capacities of the regulator

The regulator(s) plays a central role in the deployment and integration of solar and wind technologies into the national energy system. The regulator's mandate is to maintain the competitiveness in the energy market by ensuring the compliance of market players with the established rules for energy trading. A regulator should be independent to avoid conflicts of interests e.g. when there are public utilities in the market *(Case Example 11)*.

Another key characteristic is transparency. Transparency increases the confidence of investors as it makes potential risks more manageable. Last but not least, the regulator's role is to promote the investments in energy production, at the same time safeguarding consumer interests *(Case Example 12)*. Without a properly functioning regulatory system and enforcement, renewable energy has little chance to penetrate the market *(Case Example 13)*. Flaws in a regulatory system include the inability to carry out the mandate due to powers opposed to market liberalisation, ignorance of renewable energy technologies and how to structure incentive mechanisms to promote investment and slow processes (e.g. permit approval for the installation of new electricity plants).

Case Example 11 Distributed renewable energy generation in Chile

Distributed generation at residential level has so far not been possible in Chile due to a lack of specific regulation.

The *Chilean Congress* has recently approved a law on net metering that allows households to inject excess electricity into the grid. The corresponding regulation was developed by the energy ministry using international expertise.

In addition, Chilean public sector institutions were qualified during a technical visit to model regions in Germany, fostering policy dialogue on renewable energy and energy efficiency and strengthening the information exchange with public and scientific institutions, as well as private companies working in the field.

Source: GIZ, 2012, Chile: Expansion strategy for grid-connected renewable energies

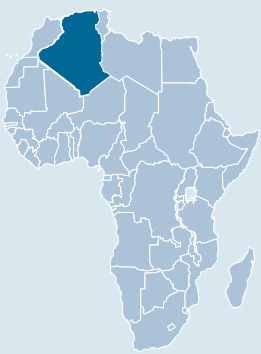
Case Example 12 Sustainable energy regulation and policy making for Africa – REEEP/UNIDO training package

This training package developed by REEEP and UNIDO is highly recommended as a reference source for better understanding regulation models and options.

Module 5 in this toolkit provides further information about the role and functions a regulatory system should fulfil.

Source: REEEP/UNIDO

Case Example 13 Regulatory system in Algeria



Within the framework of energy market liberalisation in Algeria in 2002, the *Energy Ministry* established an energy regulator *(Commission de Régulation du Mar-ché Gaz et Electricité – CREG)*. After ten years only one semi-private project has been developed and is operational today. Many factors have prevented CREG from carrying out its mandate, such as strong interests in maintaining the monopolistic position of the public utility, a lack of knowledge of appropriate renewable energy incentive mechanisms and a lack of clear rules underlying new energy installation permits.

Source: GIZ, 2011b

Promote renewable energy training and education

Skilled professionals and technicians are critical to renewable energy deployment. While higher education is a prerequisite for research, project development etc., vocational trainings are essential to provide technical services in installation, operation and maintenance. However, many educational systems are currently not prepared to are not prepared to provide for sufficient and/or sufficiently skilled people as demanded by the labour market.

Education and training measures in renewable energies are scarce and also concentrated in a few industrialised countries with comparatively developed renewable energy sectors. Even in those countries, the demand for skilled personnel stays partly unsatisfied. Existing programmes need to be redesigned, completely new ones are required and there is a need to attract potential students. IRENA's Renewable Energy Learning Partnership (IRELP) is doing important work on improving renewable energy training and education worldwide (*Case Example 14*).

E-learning options play a significant role for the qualification of professionals in renewable energy. E-learning is real alternative, especially for people who live in countries or remote areas with little or no renewable energy training available (*Case Example 15*).

Case Example 14 IRENA's Renewable Energy Learning Partnership (IRELP)

IRELP aims at:

- Increasing awareness and visibility of existing education and training resources on renewable energies and providing a better education and training resource.
- Enabling access to learning materials and useful information on education and training in renewable energies.
- Providing support to education and training providers to improve the quality and availability of education and training on renewable energies.
- Increasing both the visibility and the availability of e-learning on renewable energy.

Source: IRENA, 2011b

Case Example 15 The Spanish Research Centre for Energy, Environment and Technology (CIEMAT)

CIEMAT has an extensive training programme in renewable energy and the environment, including e-learning methods. Together with the CEDDET Foundation, CIEMAT offers a course on renewable energies for Latin American participants (currently in its tenth edition). All experts that have passed an online course related to energy join this network of currently over 600 professionals.

Source: CEDDET, 2011

Establish local knowledge structures

The creation of local knowledge is crucial to ensure the sustainable development, installation/construction and operation and maintenance of solar and wind energy installations.

When local professionals and skilled labour are scarce, foreign experts have to be imported, which can significantly increase the costs of renewable energy projects.

Local research centres, educational institutions and (vocational) training centres are a key element to ensure that capacity needs are met. These institutions not only offer capacity building for professionals and technicians. They also play a significant role in setting the right framework conditions for local renewable energy deployment. Research on policy options, market development, resource availability and technological options are key information sources for decision makers at the government level to support energy market reform processes. In addition, they often play a vital role in creating awareness and promoting the use of renewable energy technologies among end users (*Case Example 16*).

A number of renewable energy centres exist worldwide. But according to UNESCO (2004), it is mostly in those countries with the highest renewables potential that the smallest number of specialized training facilities is available. *Figure 5.1* shows the distribution of specialized solar training and research centres by region in 2004.

Case Example 16 China Wind Power Project (CWPP)

This GIZ supported project aimed to accelerate wind power development in China by creating the conditions for training technicians and engineers (individual level), developing management strategies (organisational level) and supporting the formulation of policies for wind power deployment (system level).

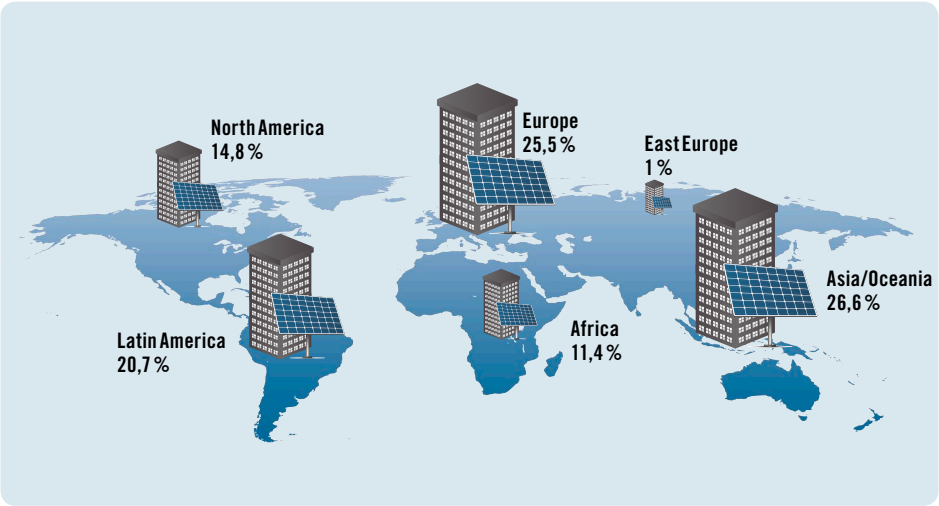
China's wind power industry grew by over 100 % in 2005-2008, increasing the demand for professionals and technicians skilled in wind energy. The project contributed significantly to bridging a shortage of qualified personnel.

Suzhou Longyuan Bailu Wind Power Vocational Training Centre was founded in 2006 and trained about 1300 technicians and engineers within just three years.

One of the key factors for success in this project was the certification of the centre's basic course as a nationally recognised qualification for working in wind farms.

Source: GTZ, 2008

Figure 5.1 Distribution of solar training and research centres by region (UNESCO, 2004)



Develop demand-oriented education and training options

As the wind and solar sectors grow, demand for professionals and technicians increases. One of the major challenges in many countries has been to satisfy the demand for individual capacities. Local education and training institutions need to develop a curriculum that matches learning objectives with skills sets required by local employers. Close collaboration with the private sector is essential to educate suitable people for solar and wind system development, construction, operation and maintenance when demand is predictable *(Case Example 17 and 18)*.

Depending on the stage of development of the solar and wind sectors, the type and number of required individual skills can vary dramatically. But predicting future labour demand and matching demand and supply for qualified personnel can be quite tricky. Investments in human resource development for solar and wind should therefore be balanced. Serious labour shortages for employers should be avoided. But at the same time it is important to ensure that professionals and skilled workers will benefit from real employment opportunities as they are created.

Another important issue to consider when designing a strategy is the lag between the moment in which a certain capacity gap is identified and the time needed to develop the needed capacity. For example if a CaDRE reveals that 5,000 electricians need to be trained to install solar energy systems, one has to consider that it might take one to three years to train them. If no appropriate training facilities are in place, it could take even longer.

Case Example 17 TECH4CDM – linking RET and climate change

The project was coordinated by *The Spanish Institute for the Diversification and Saving of Energy* (IDAE) and funded by the *6th EU Framework Programme*. The main objective of TECH4CDM was to promote renewable energies and energy efficiency technologies in five Latin American countries (Argentina, Chile, Ecuador, Mexico and Peru) as well as to enhance the use of CDM to foster these technologies. Seventeen training and technical workshops and high level seminars were conducted, with a high participation (over 1,000 participants), and several technical reports and guidelines were produced. The project was very successful and the information and documents are available on its website (still receiving over 4,000 monthly visits).

Source: TECH4CDM, 2008

Case Example 18 ER2E – Promotion of renewable energy and energy efficiency in Tunisia

In the last two years, the project organised several training sessions to educate government officials and the private sector on renewable energy and energy efficiency technologies, such as grid-connected PV, cogeneration, hybrid systems and large solar-thermal systems.

The majority of the 232 trainees stated that their knowledge on these technologies had significantly improved.

Source: GIZ, 2012a

Add value and confidence through certified training

Solar and wind technologies have almost reached maturity today and have gained more and more significance in energy markets across the world. A well trained solar and wind workforce is vital and as the demand and supply of specialised manpower increases, national and international standards and certification for training gain more and more importance (*Case Example 19*). Employers increasingly demand proof of specialised qualification, not only as a reaction to increased consumer demand, but also to reduce the risk of business failure and to achieve competitive advantages through quality products. Wind and solar energy technologies require advanced technical skills. These technologies are still in development and the development process requires excellent professionals. Strong engineering and research and development skills are needed. Thus appropriate high quality facilities that offer certified and recognised education and training need to be built and reinforced.

Case Example 19 The Almeria Solar Platform (PSA)

The PSA was founded in 1981 and belongs to the *Spanish Research Centre for Energy, Environment and Technology* (CIEMAT). It is the largest European centre for research, development and testing of concentrating solar technologies.

The PSA collaborates with a wide range of international institutions and programmes, like Solar PACES or SolLAB, Spanish and international universities and research centres, SMEs and large private companies. The PSA's training programme is open to international students.

Source: Plataforma Solar de Almeria (PSA), 2011

Improving the access to finance for renewable energy

The lack of appropriate financing options is one of the major barriers to renewable energy deployment. Apart from poor or dysfunctional government incentive structures, project developers often face difficulties in securing finance because the technology is perceived as a risk in itself. Increasing knowledge of renewable energy options and their benefits and risks at all levels of the financial community, from large transnational commercial banks to small rural credit programmes is a key issue.

In many countries, banks do not offer loans to solar and wind energy developers as they are often not fully aware of the real benefits and risks of investing in renewable energy technologies. This fact, coupled with the relatively long payback times for solar and wind energy installations discourages banks from investing in these sectors.

Another aggravating aspect can be the lack of visible installations and familiarity with renewable energy technologies. Things that are not seen and not understood lead to perceptions of greater technical risk than for familiar conventional energy generation.

In India, awareness raising and information for local banks lowered the obstacles to financing clean energy technologies *(Case Example 20)*.

Case Example 20 Solar finance capacity building initiative in India

Winrock International India worked with local and foreign experts on an initiative to improve access to finance for renewable energy projects.

Their approach was to train financiers/lenders (top level officials and branch managers) to improve their knowledge of solar home system technologies in order to make them more comfortable and confident in their abilities to assess related finance opportunities. In parallel they trained a number of trainers at faculty level to ensure a constant supply of courses for finance institutions.

They were successful: after the training the loans provided for solar lighting increased by over 565 % and for solar water heating systems by over 115 %.

Source: Winrock International India, 2002

The development of regulations and policies to support private investment, combined with a clear policy and strategy for wind and solar energy systems provides the necessary framework conditions for a functioning market.

Establish clear procedures and a one stop shop for investors

Simplifying permitting and licensing requirements and processes can increase the likelihood of successful solar and wind installations and save significant time and money for local governments, as well as project developers, installation contractors and system owners. Creating consistent permitting and licensing processes benefits investors by providing a standard set of operating procedures, reducing uncertainty, and allowing them to produce more accurate estimates. By reducing local permit/licence fees or adopting fast track procedures for solar and/or wind projects, local governments can demonstrate their support for investment in these technologies (*Case Example 21*). In addition, the efficiency of the permitting procedures can be increased through the establishment of a one stop shop (a single point of contact) for requesting, processing and receiving permits and licences.

Case Example 21 PV-legal

This project, funded by the European Commission's Intelligent Energy for Europe programme, aims to reduce bureaucratic barriers holding back the development of PV energy installations throughout Europe.

PV Legal has already produced a series of studies and recommendations for improving bureaucratic procedures in several countries, which can be used as a reference point during the CaDRE process and for the elaboration of capacity development strategies. The documents can be accessed on their home page.

Source: PV-legal, 2011

Develop technical standards

Consumers, project developers, local governments, and the solar and wind industries all benefit from wind and solar markets that encourage high quality installations. Technical standards standards like licenses and certificates, testing facilities and certifications reduce the risk that low quality and low performance technologies take a root in local markets and damage the reputation of renewable energy technologies (*Case Example 22*).

Renewable energy technology products have to meet certain minimum performance or safety standards in order to be certified. Likewise, contractors (e.g. photovoltaic system installers and electricians) need to prove that they have the necessary knowledge and skills to guarantee the proper installation of wind and solar systems.

The adoption and award of international standards is imperative to achieve competitiveness in international markets, especially in countries where solar and wind energy technology industry is starting to emerge.

Case Example 22 The role of standards for the wind manufacturing industry in the USA

The *US National Renewable Energy Laboratory's (NREL) National Wind Technology Center* started providing certification for wind turbines in 1998. Since then, US wind technology manufacturers have gained a more prominent role in the international market.

Source: NREL, 2011

Strengthen public dialogue on renewable energy

In many countries, renewable energy is still at a fledgling stage. In the early stages of deployment, public perception and political discourse play a very important role. Educating people about energy use, the implications of the use of fossil fuels and the different alternative supply options helps to create demand for renewable energy. For example citizens who are educated about solar energy benefits and understand finance options and the installation process are more likely to consider purchasing and installing solar technologies in their homes or businesses, which increases local demand for solar energy.

It is therefore very important to analyse public discourse during the CaDRE and to include awareness raising measures in capacity development strategies.

For instance, governments can have a leading role in raising public awareness and kick starting local solar and wind energy companies by integrating these technologies into their own infrastructure (*Case Example 23*).

In addition, media campaigns, workshops, educational displays, events, competitions and demonstration projects are just a few of the options for educating the public on renewable energy (*Case Example 24*).

Case Example 23 The German Renewable Energy Act (EEG)

In Germany, public pressure significantly contributed to the *Renewable Energy Act* (EEG), passed in 2000, which establishes, for instance, provisions for renewable energy feed-in tariffs. Public opinion thus outweighed that of the dominant large utilities, which strongly opposed the EEG at that time.

Source: authors

Case Example 24 The Spanish Institute for the Diversification and Saving of Energy (IDAE)

For over 25 years one of the core activities of IDAE has been the implementation of training, information and awareness raising campaigns, as well as spreading information to broaden the acceptance and deployment of renewable energy and to promote efficient and rational uses of energy. Technical guides, posters, dissemination material and audiovisuals can be found in IDAE's website.

One example is the project SOLARIZATE *(IDAE and Greenpeace*). The aim of the project is to set up solar PV systems in high schools in Spain and disseminate educational material on solar power to increase the visibility of solar energy and its benefits.

Source: *www.solarizate.org, www.idae.es*

References

Breitschopf, B., C. Nathani (2010): *Review of approaches for employment impact assessment of renewable energy deployment*, Karlsruhe.

Breitschopf, B., C. Nathani, G. Resch (2012): *Economic and Industrial Development – EID – EMPLOY, methodological guidelines for estimating the employment impacts of renewable energy use*, forthcoming 2012.

CNE (2010): *Perspectivas de la regulación energética en Iberoamérica 2010:* *www.cne.es/cne/doc/libros_en_coedicion/ariae2010/datos/index.htm*.

DTI (2004): *Renewable supply chain gap analysis.* Department of Trade and Industry (ed.), London.

EuropeAid (2005): *Institutional assessment and capacity development – why, what and how?*

Fundación CEDDET (2011): *REI Magazine: www.conecta-ceddet.org/index.php?option=com_k2&view=itemlist&task=category&id=60:rei-en-energ%C3%ADa&Itemid=232&lang=es.*

GIZ (2011a): *Projection of direct gross job potentials – (employment factors) as a suitable approach towards viable capacity assessments on an individual level – a scoping study for GIZ*, 32 pages, written by C.J. Vonnoh.

GIZ (2011b): *Capacity assessment for the solar sector of Algeria;* *http://ca.energypedia.info/index.php/Capacity_Assessment_in_Algeria* (accessed March 2012).

GIZ (2011c): *Rapport d'audit documentaire des processus du Département de l'Energie et des Mines; by excel-sud – Management & Development and COMO Consulting*, June 2011.

GIZ (2012a): *Internal report on the impact of the project for the promotion of renewable energy and energy efficiency in Tunisia.*

GIZ (2012b): *Chile – expansion strategy for grid connected renewable energies. Internal report.*

GTZ (2008): *Project Wind Environment Research & Training Centre (WERT-Centre), financed by Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU);* *www.cwpc.cn* (accessed March 2012).

GTZ (2010): *Capacity assessment- methodological guideline* (draft version). Authors: Mike Enskat, Regine Dietz, Benjamin Attigah, Rainer Schweers, Edgar Blaustein, Christian Seufert, Sabine Schmid, Eschborn, 13 pages.

GTZ-ESRA (2009): *Capacity assessment in the subsector of rural electricity supply through renewable energy technologies – Afghanistan energy programme: Renewable Energy Supply for Rural Areas (ESRA),* ed. Anita Richter, S. Schmid, F. Bemmerlein-Lux, E. Naumann – unpublished manuscript, 350 pages. *www.conecta-ceddet.org/index.php?option=com_k2&view=item&layout=item&id=274&Itemid=212&lang=en.*

IDAE (2012): *Publications. http://idae.electura.es.*

ILO (2011): *Study of occupational and skills needs in renewable energy: final report. International Labour Office, ILO Skills and Employability Department (EMP /SKILLS),* Geneva, 174 pages.

IRENA (2011a): *IRENA working paper: Renewable energy jobs: status, prospects & policies.* 32 pages *(www.irena.org/DocumentDownloads/Publications/RenewableEnergyJobs.pdf)* (accessed March 2012).

IRENA (2011b): *IRENA's Renewable Energy Learning Partnership (IRELP); www.irena.org; www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=35&CatID=110&SubcatID=156&RefID=156&SubID=161&MenuType=Q* (accessed March 2012).

Lehr, U., Missaoui, R., Marrouki, S. (2012): *Renewable energy and energy efficiency in Tunisia – employment, qualification and economic effects – past, present, future, study for GIZ.* Publication due April 2012.

Major Economies Forum – MEF (2009a): *Technology action plan: wind energy – report to the major economies forum on energy and climate; by Germany, Spain & Denmark in consultation with MEF Partners*; *www.majoreconomiesforum.org/the-global-partnership/wind-energy.html* (accessed March 2012).

Major Economies Forum – MEF (2009b): *Technology action plan: solar energy – report to the major economies forum on energy and climate; by Germany and Spain in consultation with MEF Partners*; *www.majoreconomiesforum.org/the-global-partnership/solar-energy.html* (accessed March 2012).

National Renewable Energy Laboratory – NREL (2011): *Special compilation of experiences and lessons learned for the elaboration of the handbook and toolbox for CaDRE.*

Plataforma Solar de Energía – PSA (2011): *www.psa.es* (accessed March 2012).

PV-legal (2011): *www.pvlegal.eu/en/home.html* (accessed March 2012).

REEEP/UNIDO: *Sustainable energy regulation and policy making for Africa – training Package* REEEP/UNIDO *http://africa-toolkit.reeep.org* (accessed March 2012).

REN21 (2011): *Renewables 2011 Global Status Report (Paris: REN21 Secretariat),* 115 pages. *www.ren21.net/Portals/97/documents/GSR/GSR2011_Master18.pdf* (accessed March 2012).

Rutowitz, J., A. Atherton (2009): *Energy sector jobs to 2030: a global analysis, Prepared for Greenpeace International by the Institute for Sustainable Futures, University of Technology,* Sydney.

Singh V., J. Fehrs (2001): *The work that goes into renewable energy, Renewable Energy Policy Project, Research report No. 13,* Washington D.C. 75.

TECH4CDM (2008): *www.tech4cdm.com.*

UNDP – United Nations Development Programme (2009): *Capacity development: a UNDP Primer.* Editor: Kanni Wignaraja, New York, 64 pages *(www.undp.org/capacity and http://tinyurl.com/7d4eqwz)* (accessed March 2012).

UNESCO (2004): *UNESCO's global renewable energy education and training programme; www.fvee.de/fileadmin/publikationen/Themenhefte/sf2004/sf2004_03_02.pdf* (accessed March 2012).

Wei, M., S. Patadia, D.M. Kammen (2010): *Putting renewables and energy efficiency to work: how many jobs can the clean energy industry generate in the US? in Energy Policy 38,* 919-913.

Winrock International India (2002): *Solar finance capacity building initiative; www.winrockindia.org/comp_proj_ene_sfcbi_26.htm* (accessed March 2012).

Contributors

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Broad-based expertise for sustainable development: The services delivered by the *Deutsche Gesellschaft für Internationale Zusammenarbeit* (GIZ) *GmbH* draw on a wealth of regional and technical expertise and tried and tested management know-how. As a federal enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development. GIZ is also engaged in international education work around the globe.

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IDAE
Instituto para la Diversificación y Ahorro de la Energía

The *Institute for Energy Diversification and Saving*, IDAE, is a public business body ascribed to the *State Secretariat for Energy of the Ministry of Industry, Energy and Tourism.*

The achievement of the national objectives established by the planning actions relating to saving and energy efficiency and to renewable energies make up the strategic framework of its activity.

IDAE coordinates and jointly manages the measures and funds devoted to these planning actions and carries out dissemination and technical counseling, training and awareness campaigns and project financing for technological innovation. The Institute is also internationally active within the framework of various European programmes, as well as through cooperation projects with third countries.

In a nutshell, IDAE is oriented towards the achievement of a new energy model that guarantees the quality and security of supply and enhances the competitiveness of Spanish firms on the basis of sustainability.

The *International Renewable Energy Agency* (IRENA) is an intergovernmental organisation dedicated to renewable energy. In accordance with its Statute, IRENA's objective is to *promote the widespread and increased adoption and the sustainable use of all forms of renewable energy*. This concerns all forms of energy produced from renewable sources in a sustainable manner, which include bioenergy, geothermal energy, hydropower, ocean, solar, and wind energy.

IRENA was founded in 2009 in Bonn, Germany, by 75 States which signed its Statute. As of February 2012, the membership of IRENA comprises 155 States and the European Union. The Agency is headquartered in Abu Dhabi, *United Arab Emirates.*

The *National Renewable Energy Laboratory* (NREL) is the only national laboratory solely dedicated to advancing renewable energy and energy efficiency technologies from concept to commercial application. For 35 years, NREL innovations, analysis, and expertise have enabled the emergence of a U.S. clean energy industry. NREL's 327-acre main campus in Golden, Colorado, is a living model of sustainable energy. The laboratory also operates the *National Wind Technology Center* on 305 acres located 13 miles north of its main campus. NREL develops renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovations to address the nation's energy and environmental goals. NREL is a national laboratory of the *U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy,* operated by the *Alliance for Sustainable Energy,* LLC.

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Dag-Hammarskjöld-Weg 1-5
65760 Eschborn
T +49 6196 79 0
E *www.giz.de*

Division for Water, Energy and Transport

Dr. Mike Enskat
Senior Project Manager
E *mike.enskat@giz.de*

Joscha Rosenbusch
Project Manager
E *joscha.rosenbusch@giz.de*

Authors
Florian Bemmerlein-Lux (ifanos concept&planning)
E *flo@ifanos-concept.eu*

Ilka Neyla Buss (freelance consultant)
E *ilkabuss@gmail.com*

Contributors
- Anita Richter, Joscha Rosenbusch, Mike Enskat (GIZ)
- Sofia Martínez Martínez (IDAE)
- Cornelia Marschel, Hugo Lucas (IRENA)
- Caroline Uriarte, Ron Benioff, Sadie Cox (NREL)

Peer Reviewers
- Alba Gamarra, Executive Director, Centro de Información en Energías Renovables (CINER)
- Benoît Lebot, Climate Change Advisor, United Nations Development Programme (UNDP)
- David Vilar Ferrenbach, Resident Coordinator, ECOWAS Regional Centre for Renewable Energy and Energy Efficiency (ECREEE)
- Gabriela Elizondo, Senior Energy Specialist, Sustainable Energy Department / SEGEN, the World Bank
- Peter Bank, Partner, ifanos concept&planning

Production Assistant
Jadranka Saravanja (GIZ)

Design and Layout
creative republic // Thomas Maxeiner Kommunikationsdesign
Frankfurt am Main, Germany
E *contact@creativerepublic.net*

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Notes

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