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Achieving Inclusive Competitiveness in the Emerging Solar Energy Sector in Morocco

Georgeta Vidican
Matthias Böhning
Gina Burger
Elisa de Siqueira Regueira
Sandra Müller
Susanne Wendt

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The German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE) is a multidisciplinary research, consultancy and training institute for Germany's bilateral and multilateral development cooperation. On the basis of independent research, it acts as consultant to public institutions in Germany and abroad on current issues of cooperation between developed and developing countries. Through its nine-month training course, the German Development Institute prepares German and European university graduates for careers in the field of development policy.

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The authors Bonn, October 2013

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Abbreviations

ACWA	Arabian Company for Water and Power Projects
ADEREE	Agence Nationale pour le Développement des Énergies Renouvelables et de l'Efficacité Énergétique / National Agency for the Development of Renewable Energies and Energy Efficiency
AFD	Agence Française de Développement
AfDB	African Development Bank
AHK	German Chamber of Commerce
AMDI	Agence Marocaine de Développement des Investissements / Moroccan Investment Development Agency
AMISOLE	Association Marocaine des Industries Solaires et Eoliennes
ANME	Tunisian National Agency for Energy Conservation
ANPME	Agence Nationale pour la Promotion de la Petite et Moyenne Entreprise
ASPM	Accompagnement du Plan Solaire Marocain
AUC	American University Cairo
BIS	Department for Business Innovation & Skills of the Government of the United Kingdom
BMCI	Banque Marocaine pour le Commerce et l'Industrie
BNSTP	Bourse Nationale de Sous-traitance et de Partenariat
BOS	Balance of Systems
CCG	Caisse Centrale de Garantie
CDER	Centre de Développement des Energies Renouvelables / Center for Development and Renewable Energies
CDG	Caisse de Dépôt et de Gestion Capital Infrastructure
CE3M	Association de Cluster Éléctronique, Mécatronique et Mécanique du Maroc
CGEM	Confédération Générale des Entreprises du Maroc
CME	Compagnie Marocaine des Energies

CMI	Centre Marocain de l'Innovation
CNRST	Centre National pour la Recherche Scientifique et Technique
CPV	Concentrated Solar Photovoltaics
CRI	Centre Régional d'Investissement / Regional Investment Centre
c-SI	Crystalline Silicon
CSP	Concentrated Solar Power
CTF	Clean Technology Fund
DIE	Deutsches Institut für Entwicklungspolitik / German Development Institute
Dii	Desert Power Industrial Initiative GmbH
DLR	Deutschen Zentrums für Luft- und Raumfahrt / German Aerospace Center
ECDPM	European Centre for Development Policy Management
EIB	European Investment Bank
ENIM	Ecole Nationale de l'Industrie Minérale
EPIA	European Photovoltaic Industry Association
ERDK	Essaid Raoui Développement Kénitra
ESTIF	European Solar Thermal Industry Federation
EU	European Union
EUR	Euro
FDI	Foreign Direct Investment
FENELEC	National Federation of Electricity, Electronics and Renewable Energies
FER	Fonds d'Énergies Renouvelables
FIAS	Foreign Investment Advisory Service
FIPA	Foreign Investment Promotion Agency
FIT	Feed-in Tariff
GBP	British Pound
GCR	Global Credit Research

GGGI	Global Green Growth Institute
GIB	Green Investment Bank
GIPB	Global Investment Promotion Best Practices
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GW	Gigawatt
ICT	Information and Communications Technology
IFC	International Finance Cooperation
IFMEREE	Instituts de Formation aux Métiers des Énergies Renouvelables et de l´Éfficacité Énergétique / Institutes for Renewable Energy and Energy Efficiency
ILO	International Labour Organization
IMF	International Monetary Fund
IPP	Independent Power Producer
IPR	Intellectual Property Right
IRENA	International Renewable Energy Agency
IRESEN	Institut de Recherche en Energie Solaire et Energies Nouvelles
ISPAT	Investment Support and Promotion Agency of Turkey
IT	Information Technology
KfW	Kreditanstalt für Wiederaufbau
KOSGEB	Republic of Turkey Small and Medium Enterprises Development Organization
kV	Kilovolt
kWh	Kilowatt Hour
LCR	Local Content Requirement
LOG	Longreach Oil and Gas
LPG	Liquefied Petroleum Gas
MAD	Moroccan Dirham
MANEREE	Master National en Energie Renouvelable et en Efficacité Energétique

MAScIR	Moroccan Foundation for Advanced Sciences, Innovation and Research
MASEN	Moroccan Agency for Solar Energy
MCINET	Ministère de l'Industrie, du Commerce et des Nouvelles Technologies / Ministry of Industry, Trade and New Technologies
MEMEE	Ministère de l'Energie, des Mines, de l'Eau et de l'Environnement / Ministry of Energy, Mines, Water and Environment
MENA	Middle East and North Africa
MIT	Massachusetts Institute of Technology
MSP	Mediterranean Solar Plan
MW	Megawatt
NCSD	National Council for Sustainable Development
NPE	National Platform for Electromobility
OCP	L'Office Chérifien des Phosphates
ODI	Overseas Development Institute
OECD	Organisation for Economic Co-operation and Development
ONEE	Office National de l'Électricité et de l'Eau Potable
PERG	Programme d'Électrification Rurale Globale / Rural Electrification Programme
PROMASOL	Projet de Développement du Marché Marocain des Chauffe Eau Solaires
PTB	Physikalisch-Technische Bundesanstalt
PV	Photovoltaics
PWMSP	Paving the Way for the Mediterranean Solar Plan
RCREEE	Regional Center for Renewable Energy and Energy Efficiency
RE	Renewable Energy
REN21	Renewable Energy Policy Network for the 21st Century
REUNET	Renewable Energy University Network
R&D	Research and Development
SIE	Société d'Investissements Energétiques

SMADER	Moroccan Society of Renewable Energy Development
SME	Small and Medium-sized Enterprise
SWH	Solar Water Heater
SWOT	Strengths, Weaknesses, Opportunities and Threats
SWP	Solar Water Pump
TNC	Transnational Corporation
Toe	Tonnes of Oil Equivalent
UAE	United Arab Emirates
UfM	Union for the Mediterranean
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNIDO	United National Industrial Development Organisation
V-Lab	Venture Lab
WEF	World Economic Forum
WTO	World Trade Organization
YOIKK	Yatırım Ortamını İyileİtirme Koordinasyon Kurulu

Executive summary

More recently, the Middle East and North Africa (MENA) region has been the focal point of large investments in renewable energy (RE), primarily due to excellent availability of RE resources (i.e. solar irradiation and wind speed in coastal areas). Cross-national initiatives such as Desertec and the Mediterranean Solar Plan (MSP) have also contributed to raising interest in the high potential that RE has for satisfying domestic energy demand in the MENA countries as well as for achieving energy market integration with the European countries through green electricity exports.

As a result, most countries across the MENA region have set RE targets in an effort to diversify their energy mix. RE investments have also been motivated by the expected socio-economic benefits that could be achieved, such as: economic development opportunities through sales of new products, job creation and an increased local tax base; opportunities for exports to international markets, thereby further enhancing prospects for local economic development; savings that result in lower-cost equipment, electricity and, hence, higher growth rates in capacity additions; and spillover effects that result from the development of an emerging industry.

These potential benefits are relevant for MENA countries, given the enormous development challenges confronting the region, especially in terms of unemployment and industrial development. Hence, a core challenge for the MENA countries is finding a strategic approach to internalise the benefits from RE, especially with respect to private sector development, acquiring technological capabilities and employment creation.

Morocco provides an interesting case to examine for several reasons. First, the country currently imports more than 95 per cent of its energy, and its energy demand is expected to triple by 2030 (MEMEE 2011). This strong dependence on imports places Morocco in a very precarious energy and financial situation over the next decades. However, due to its geographical location, Morocco benefits from vast RE resources, which could be exploited to provide energy beyond its domestic needs. Second, similarly to other countries in the region, Morocco suffers from a high unemployment rate, especially among the educated youth – a situation

that calls for private sector development with a focus on job creation. Last, compared to agriculture and tourism, Morocco's manufacturing base is relatively low, industrial competitiveness is deficient and entrepreneurship is limited.

To respond to these challenges, the Moroccan government has engaged in a highly dynamic and ambitious process of developing the RE sector. As a result, Morocco has become known as the most promising destination for solar and wind energy in the MENA region. Like other countries in the region, Morocco has set specific targets for both solar and wind energy. What distinguishes Morocco from other countries, however, is its commitment to linking solar and wind electricity generation projects to industrial development, employment generation and competitiveness more generally. As such, the overall approach embraced by the Moroccan government appears to be more comprehensive than, for example, the ones being pursued by Tunisia and Egypt. At the same time, the potential for green electricity exports to Europe, facilitated by Morocco's proximity to Spain, offers unique market opportunities that could be critical for the development of a local RE sector. The efforts made by Morocco's government to maintain political stability in times of major turmoil across the MENA region reinforce Morocco as a potential upcoming market for solar and wind energy. The high level of investment that has already materialised for the rollout of the first large-scale RE plants demonstrates this positive outlook. All these factors, if adequately channelled, could contribute to positioning Morocco as a regional and global player in the RE sector.

The focus on solar energy is particularly relevant for several reasons: solar energy comprises a range of technologies with different degrees of technological sophistication and potential for job creation; a high level of investment has been committed to already by international financial actors and the national government; large-scale solar energy deployment has high potential for exports to Europe; previous experience with off-grid solar energy solutions for rural electrification in Morocco created a base of local enterprises interested in expanding their operations and diversifying into other market segments.

Yet, given the high financial commitment that Morocco has made for these developments and the socio-economic problems that the country is confronted with, an important challenge for the Moroccan policy-makers is how to internalise the benefits that RE can offer. Consequently, the challenge for policy-makers and development cooperation actors is to develop a road map geared towards achieving competitiveness in the Moroccan solar energy sector so that: (a) it creates employment opportunities along the value chain, (b) technological capabilities are enhanced (with respect to production, knowledge and R&D), and (c) domestic companies are integrated in the supplier base for the emerging market. Moreover, given that technological know-how is concentrated in a few developed economies, technology transfer through business linkages is critical in the early stages of development in Morocco. In this study we use the term "inclusive competitiveness" to refer to this more complex approach to competitiveness, which we consider necessary for evaluating Morocco's efforts to developing the solar energy sector in a more integrated way.

To achieve inclusive competitiveness, we highlight that three sets of factors are necessary, which constitute the building blocks for the development of the solar energy sector: (a) certain framework conditions for the development of the local industry need to be in place; (b) business linkages have to be fostered and geared towards technology transfer; and (c) policy measures should be integrated within an industrial development strategy to be implemented in a systemic approach.

First, certain **framework conditions** are needed with respect to local technological capabilities, private sector investment and market size. **Technological capabilities** are critical for enhancing competitiveness, as local companies have to be able to learn, internalise and utilise management skills and technological knowledge (UNCTAD 2010). Such capabilities are acquired through knowledge creation (education and training) and expansion of basic and applied research in close cooperation with the private sector. In addition, firm-level industrial upgrading programmes are needed to enable firms to create and implement innovation and enhance products, processes and organisational structures. Such programmes support local companies in becoming attractive partners for more experienced firms (i.e. leading technology firms or transnational companies) and benefit from spillover effects (Altenburg 2000, 35).

Given the high capital intensity of solar energy, another framework condition necessary for the development of a sector is **private sector investment**. High levels of investment are needed to boost solar electricity generation as well as to support the development of a local industry. To this end, it is critical to mobilise investment through targeted investment-promotion and facilitation measures as well as to identify financing mechanisms locally and internationally. However, a critical condition for both acquiring a basic level of technological capabilities and for attracting private sector investment is the presence of a **sizable and visible market** for solar energy in Morocco. Without creating a domestic market for solar energy, various stakeholders, locally and internationally, cannot find a justification for engaging in the emerging solar energy sector.

A second main aspect of enhancing competitiveness in the emerging solar energy sector is the creation of **business linkages** between domestic and foreign firms. Competitiveness of countries and enterprises depends to a great extent on their ability to tap international sources of knowledge as well as on their ability to absorb and use it to deploy its resources more efficiently (Altenburg 2005, 21). One of the best ways to access those resources and produce higher value-added goods and services is to establish business linkages between transnational corporations (TNCs) and local small and medium-sized enterprises (SMEs) (Altenburg 2005; UNCTAD 2000). Business linkages are crucial to providing local companies with the necessary assets and incentives to increase competitiveness and overall productivity (UNCTAD 2010, 9ff.), while also contributing towards attracting private sector investment. The reinforcing relation between framework conditions and business linkages is represented in our analytical framework. Various policy mechanisms for fostering business linkages geared towards technology transfer are important: business partnerships, inter-company training, technology licensing, supplier development programmes and local content regulations. Orienting these policy mechanisms towards local employment creation and embedding local enterprises in the value chain for solar energy is likely to contribute towards achieving inclusive competitiveness.

Third, while all these factors are critical, a **comprehensive national strategy** for the development of the Moroccan solar energy sector is needed. Without such a strategy to target both the development of a sizable local market for solar energy and the development of a local industry, stakeholders do not receive the necessary signals to engage – on a systematic basis – in the emerging sector. Such a comprehensive national solar energy strategy, closely aligned with the industrial development strategy, is likely to support competitiveness and local value creation.

In light of the analytical framework highlighted above, we examine three main research questions:

1. What are the main challenges and opportunities for achieving inclusive competitiveness in the emerging solar energy sector in Morocco?
2. What policies and resources are needed for supporting the development of business linkages in the emerging solar energy sector in Morocco?
3. What is the strategic approach that Morocco's policy-makers are following to identify the most effective way to develop the solar energy sector, and how can it be improved?

Data for the study has been collected using semi-structured interviews and secondary literature. Between 11 February and 1 April 2013, 80 semi-structured interviews were conducted based on an interview guide developed and customised for different sets of stakeholders in: government; private sector; academia and research; financial institutions; non-governmental organisations; development cooperation.

Findings from this study are geared towards assisting Moroccan policy-makers and development cooperation actors in the elaboration of a long-term strategic approach for the development of the solar energy sector aimed at increasing competitiveness of local companies and expanding the value added for the local economy and society, while drawing on good practices in industrial development.

This study is timely as Moroccan policy-makers and development cooperation actors are currently highly engaged in identifying entry points and venues for developing a local solar energy sector, while at the same time addressing the pressing increase in energy demand. The challenges, however, are high, as technology know-how is concentrated in the North, competitive advantage in manufacturing is relatively low and MENA regional markets are rather limited. Nevertheless, Morocco has distinguished itself in the MENA region through its successful industrial policy with regards to other sectors oriented towards the European markets, and it is currently showing strong commitment to exploiting the excellent RE resources it benefits from.

This comprehensive assessment we performed, using interviews with a wide range of stakeholders, points towards two main insights that cut across the various aspects discussed in this report and serve as necessary conditions for achieving inclusive competitiveness in the emerging solar energy sector. First, **creating a market** for both small and large-scale solar projects and applications is critical – a local industry cannot emerge without a sizable local market and long-term consistency with respect to market development. Second, **developing an integrated strategy** that aligns industrial policy with education and R&D policy, offering targeted measures for industrial upgrading and business linkages, is necessary – existing industrial development efforts are likely to fall short of creating a competitive solar energy sector without a strategy that offers a road map for integrating different inter-dependent measures.

Our findings suggest that opportunities exist for Morocco to expand its capabilities in several market segments for solar energy: CSP, photovoltaics (PV), solar water heaters (SWHs) and solar water pumps (SWPs). The policy actions needed to support industrial development in these market segments vary. Whereas for large-scale CSP and PV long-term market development (or consistency), export opportunities and the enhancement of knowledge and R&D capabilities through business linkages are critical, small-scale PV, SWH and SWP implementation require policy interventions related mainly to reforming energy subsidies, improving quality standards and identifying financing mechanisms to support consumers. In our analysis, we also assess the effectiveness of existing policies and programmes and identify good practices within the private sector in Morocco and abroad that can serve as learning platforms for enhancing competitiveness. Lastly, we propose an approach for developing an integrated strategy for the solar energy sector and an institutional mechanism for systematic implementation.

1 The importance of renewable energy for the MENA region

Countries in both the developed and the developing world are seeking to expand their use of RE, driven by climate change concerns and the increasing demand for energy due to economic and population growth. More recently, the MENA region has been the focal point of large investments in RE, primarily due to excellent availability of RE resources (i.e. solar irradiation and wind speed in coastal areas). Cross-national initiatives such as Desertec, the Desert Power Industrial Initiative (see Box 1) and the MSP (see Box 2) have also contributed to raising interest in the high potential that RE has for satisfying domestic energy demand in the MENA countries as well as for achieving energy market integration with the European countries through green electricity exports.

As a result, most countries across the MENA region have set RE targets in an effort to diversify their energy mix. Interest in RE has also been motivated by the expected socio-economic benefits that could be achieved, such as: economic development opportunities through sales of new products; job creation and an increased local tax base; opportunities for exports to international markets, thereby further enhancing prospects for local economic development; savings that result in lower-cost equipment, electricity and, hence, higher growth rates in capacity additions; spillover effects that result from the development of an emerging industry.

These potential benefits become even more relevant for MENA countries, given the enormous development challenges confronting the region, especially in terms of unemployment and industrial development. First, unemployment rates among the educated youth are the highest worldwide (ILO 2011a). Second, most countries in the region consistently rank low in terms of private sector competitiveness and technology development (WEF 2012). Hence, a core challenge for the MENA countries is finding a strategic approach to internalise the benefits from RE, especially with respect to private sector development, know-how expansion and employment creation.

Although these aspects have been widely emphasised in the literature on low-carbon development in the MENA region and in other developing countries (IRENA 2011; World Bank 2011), only a few empirical studies have been conducted to assess how to enable emerging countries to not only deploy RE technologies, but to also develop new markets and foster industrial competitiveness (ILO 2011b; Lewis 2007; Vidican 2012a).

Box 1: The Desertec Foundation and the Desert Power Industrial Initiative

An international network of politicians, academics and economists developed the Desertec Concept between 2003 and 2007 to ensure climate protection, energy security and development by generating sustainable energy from the sites where RE is available in abundance – especially in the MENA region. The vision is to generate sustainable RE from areas where excellent solar irradiation and wind conditions can meet the local demand, and to export excess power to the European Union (EU). Desertec could enable a market that would satisfy 15 per cent of Europe's electricity demand, mainly through solar energy imports of about 700 terawatt hours per year from 20 to 40 locations in the MENA region.

To pursue this vision, the non-profit Desertec Foundation was initiated in 2009, which, in turn, launched the Desert Power Industrial Initiative (Dii)[1] together with representatives from the industrial and finance sectors of European and North African countries.

The concrete task of Dii is to implement the Desertec Concept and its vision is focused on the EU and MENA regions. To this end, Dii aims at creating an integrated energy market for renewables, catalysing the development of new industries, attracting foreign investments by creating a positive investment climate, creating employment opportunities and transferring know-how to the MENA region. Their recent study "Desert Power 2050: Perspectives on a Sustainable Power System for EUMENA" aims to demonstrate that a power system based on more than 90 per cent of RE is technically possible and economically viable (Dii 2013b).

Box 2: The Mediterranean Solar Plan (MSP)

The Union for the Mediterranean (UfM) launched the MSP in 2008 as a flagship initiative to develop policy framework conditions allowing a large-scale and market-driven deployment of RE and energy efficiency technologies in the region, to meet the region's major energy and climate challenges. In particular, it aims at:

1 Dii was previously known under the name of Desertec Industrial Initiative.

- setting up an adequate legal, regulatory, economic, institutional and organisational environment to facilitate the development and deployment of solar energy;
- triggering international investment;
- generating a capacity of 20 gigawatts (GW) by exploiting RE sources in the southern and eastern Mediterranean region;
- establishing local value chains around the RE technologies;
- supplying the local market while also exporting to the EU and thereby generating revenue;
- creating regionally integrated and private-sector-driven markets for RE;
- improving energy efficiency in the Mediterranean region;
- creating jobs and industrial capacities in the southern Mediterranean countries.

As such, MSP activities complement the efforts of the Desertec Foundation and of Dii.

Source: UfM (2013)

Morocco provides an interesting case to examine for several reasons. First, Morocco currently imports 95 per cent of its energy, and its energy demand is expected to triple by 2030 (MEMEE 2011). This strong dependence on imports places Morocco in a very precarious energy and financial situation over the next decades. However, due to its geographical location, Morocco benefits from vast RE resources, which could be exploited to provide energy beyond its domestic needs. Second, similarly to other countries in the region, Morocco suffers from a high unemployment rate, especially among the educated youth – a situation that calls for private sector development with a focus on job creation. Last, compared to agriculture and tourism, Morocco's manufacturing base is relatively small, industrial competitiveness is deficient and entrepreneurship is limited.[2] Yet, positive outcomes in

2 Interview with a representative from a leading Moroccan research institute in Rabat on 25 March 2013.

the aerospace and electronics sectors (The Wall Street Journal 2013) demonstrate that harnessing the existing potential is possible if foreign investment is geared in a way that supports the development of domestic capabilities.

To respond to these challenges, the Moroccan government has engaged in a highly dynamic and ambitious process of developing the RE sector. As a result, Morocco has become known as the most promising destination for solar and wind energy in the MENA region. Like other countries in the region, Morocco has set specific targets for both solar and wind energy. What distinguishes Morocco from other countries, however, is its commitment to linking solar and wind electricity generation projects to industrial development, employment generation, and competitiveness more generally. As such, the overall approach embraced by the Moroccan government appears to be more comprehensive than, for example, the ones being pursued by Tunisia and Egypt. At the same time, the potential for green electricity exports to Europe, facilitated by Morocco's proximity to Spain, offers unique market opportunities that could be critical for the development of a local RE sector. The efforts made by Morocco's government to maintain political stability in times of major turmoil across the MENA region reinforce Morocco as a potential upcoming market for solar and wind energy. The high level of investment that has already materialised for the rollout of the first large-scale RE plants demonstrates this positive outlook. All these factors, if adequately channelled, could contribute to positioning Morocco as a regional and global player in the RE sector.

Solar energy is particularly interesting to assess in Morocco: solar energy comprises a range of technologies with different degrees of technological sophistication and potential for job creation; a high level of investment has been committed already by international financial actors and the national government; large-scale solar energy deployment has high potential for exports to Europe; previous experience with off-grid solar energy solutions for rural electrification in Morocco created a base of local enterprises interested in expanding their operations and diversifying into other market segments.

Various international donor agencies are active in the Moroccan energy sector. Both bilateral donor agencies and multilateral organisations have supported the development of the Moroccan energy sector for decades. Among the largest bilateral donors are the Agence Française de Développement (AFD) and the Kuwait Fund for Arab Economic Development. The latter mostly invested in infrastructure and dam projects. In the solar energy sector in Morocco, they contributed to the rural electrification programme and the development of the power distribution through transmission lines in the national grid system with 55 million EUR. The multilateral organisations include the World Bank, the EU (through entities such as the European Investment Bank (EIB) and the European Bank for Reconstruction and Development), the African Development Bank (AfDB) and the Arab Fund for Economic and Social Development. Their focus is supporting the Rural Electrification Programme (PERG) and the expansion of the transmission grid infrastructure. The World Bank contributed with US$ 200 million to the first phase of Ouarzazate, whereas the EIB mostly invested in projects together with the national utility, Office National de l'Électricité et de l'Eau Potable (ONEE) in wind, hydro and solar power as well as rural electrification. The EU also contributed to the first phase of Ouarzazate, Morocco's first large-scale CSP plant, and the general promotion of RE and energy efficiency with a grant of 30 million EUR from the Neighborhood Investment Facility. The Arab Fund for Economic and Social Development invests mostly in agriculture, energy, industry and mining, social services, transport as well as water and sewage. The AfDB financed PERG with a loan of US$ 486 million and supported the Centrale solaire de Quarzazate. The AFD also financed part of Ouarzazate through its general engagement in supporting Plan Solaire. They furthermore contributed to PERG and the grid expansion. What sets them apart from other donors is their engagement in the Plan Emergence, Le Pacte National Poul l'Émergence Industrielle, where they support industrial platforms and cluster activities together with MEDZ (a large developer in Morocco).

In the field of renewable energy, financial cooperation is characterised in the form of investment loans by multilateral institutions such as the World Bank, the EU and the AfDB. However, German bilateral development cooperation has been the most active in the renewable energy sector. In accordance with the three priority areas for cooperation,[3] the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is implementing two projects that concern renewable energy. The ASPM-Project (Accompagnement du Plan Solaire Marocain) supports the Moroccan Agency for Solar Energy (MASEN) in the implementation of Plan Solaire, whereas the PEREN-Project (Promo-

3 These bilaterally agreed upon priority areas consist of the use and management of water resources, environmental protection and climate change measures, and sustainable economic development.

tion of Renewable Energy and Energy Efficiency) supports the National Agency for the Development of Renewable Energies and Energy Efficiency (ADEREE) in its efforts to meet the Moroccan energy targets. In the area of financial cooperation, the Kreditanstalt für Wiederaufbau (KfW) has financed solar projects, wind parks and the construction and modernisation of more than 20 hydropower stations through loans and grants. For Ouarzazate (first phase) they contributed 100 million EUR in loans and 15 million EUR as a grant (from the Federal Environment Ministry under the framework of the International Climate Initiative); for the four wind parks, KfW gave 130 million EUR as a loan. The German engagement in the Moroccan renewable energy sector will expand further in the next years, among others under the framework of the German Climate Technology Initiative.

Most of the aforementioned international actors have also played an important role in financing the first phase of the Ouarzazate solar plant. Here, domestic funding has been complemented with loans and grants from the World Bank, the Clean Technology Fund, AfDB, EIB, AFD and KfW.

Yet, given the high financial commitments that Morocco has made as well as received for these developments, and given the socio-economic problems that the country is confronted with, an important challenge for Moroccan policy-makers is how to internalise the benefits that RE can offer. Consequently, the challenge for policy-makers and development cooperation actors is to develop a road map geared towards achieving competitiveness in the Moroccan solar energy sector so that:

- **employment** opportunities should be created along the value chain;
- **technological capabilities** are enhanced (with respect to production, knowledge and R&D); and
- domestic **companies are integrated in the supplier base** for the emerging market.

Moreover, given that technological know-how is concentrated in a few developed economies, technology transfer through business linkages is critical in the early stages of development in Morocco. In this study we use the term "inclusive competitiveness" to refer to this more complex approach to competitiveness (see Chapter 2 for more detail), which we consider necessary for evaluating Morocco's efforts to developing the solar energy sector in a more integrated way.

1.1 Research questions and methods

In light of the context and challenges highlighted above, we examine three main research questions:

1. *What are the main challenges and opportunities for achieving inclusive competitiveness in the emerging solar energy sector in Morocco?*
2. *What policies and resources are needed for supporting the development of business linkages in the emerging solar energy sector in Morocco?*
3. *What is the strategic approach that Morocco's policy-makers are following in order to identify the most effective way to develop the solar energy sector, and how can it be improved?*

To elicit answers to these research questions and identify relevant recommendations for policy-makers, we used qualitative research methods. We supplemented this data with relevant literature on RE policy, industrial policy and private sector development. Findings from this study are geared towards assisting Moroccan policy-makers and development cooperation actors in the elaboration of a long-term strategic approach for the development of the solar energy sector aimed at increasing competitiveness of local companies and expanding the value added for the local economy and society. We also aim to provide policy-makers with examples of good practices in industrial development to stimulate learning, emphasising that policies should be customised to the specific local framework conditions.

1.2 Data collection and analysis

Data for this study was collected using face-to-face semi-structured interviews, participant observation, focus groups and by examining secondary literature. The sampling for the semi-structured interviews was done using non-probability sampling methods, specifically purposive and snowball sampling (Schutt 2001).[4] We first identified all the relevant stakeholders in

4 In purposive sampling, each sample element is selected for a purpose, usually because of the unique position of the sample elements. Purposive sampling may involve studying the entire population of some limited group or a subset of a population. For snowball sampling, you identify one member of the population and speak to him/her, then ask that person to identify others in the population and speak to them, then ask them to identify others, and so on. The sample thus "snowballs" in size (Schutt 2001, 130–134).

the policy-making sphere as well as companies active in the renewable energy sector (both solar and wind energy) (mainly from the Moroccan industry associations' databases), academia and research, the financial sector and development cooperation. Then we expanded our sample using references from key informants and contacts from national- and regional-level solar energy conferences.

The semi-structured interviews were conducted based on an interview guide that we developed and customised for different sets of stakeholders in: government; private sector; academia and research; financial institutions; development cooperation. The interview guide served as a "living document" throughout our data collection process, allowing us to alter and adjust our questions for specific stakeholders. Between 11 February and 1 April 2013, we conducted more than 80 interviews. Annex 1 shows a list with all the interviews clustered by stakeholder type. All interviews were transcribed and/or extensive notes were taken.

We also used the participant observation approach, which was carried out by visiting various conferences and participating in stakeholder meetings. The visits to two conferences on solar energy and a conference on investment in the MENA region were especially useful in this regard. The opportunity to participate in a meeting of university professors and researchers on a future platform for renewable energy studies was valuable for analysing the current state of cooperation, for learning about various critical issues and for observing the level of debate between various stakeholder groups. In addition, one focus group activity was performed by holding a workshop with an intended sampling group from representatives of all stakeholders at the end of our fieldwork to present, discuss and exchange our preliminary findings. A review of the relevant literature was also conducted based on government documents, industry reports, development policy reports and academic papers.

To facilitate data analysis, we coded all interviews with the software Atlas.ti based on the main themes and relevant concepts (see Annex 2 for the list of codes). The process of coding allowed us to identify and compare the central lines of argumentation within the main themes. After analysing the similarities and differences in the argumentations of the interviewees, we evaluated the key findings against the benchmark of common practices in Morocco (i.e. legal framework, market condition and policies). These findings, together with insights from examining the secondary literature, served as the base for exploring our research questions and for identifying policy recommendations.

1.3 Summary of findings and outline of the study

Our study on the development of the solar energy sector in Morocco is timely. Moroccan policy-makers and development cooperation actors are currently highly engaged in identifying entry points and venues for developing a local solar energy sector, while at the same time addressing the pressing increase in energy demand. The challenges, however, are high, as technology know-how is concentrated in the North, competitive advantage in manufacturing is relatively low and MENA regional markets are rather limited. Nevertheless, Morocco has distinguished itself in the MENA region through its successful industrial policy with regards to other sectors oriented towards the European markets, and it is currently showing strong commitment to exploiting the excellent RE resources it benefits from.

Our findings point towards two main insights that cut across the various aspects discussed in this report and serve as necessary conditions for achieving inclusive competitiveness in the emerging solar energy sector. First, **creating a market** for both small and large-scale solar projects and applications is critical – a local industry cannot emerge without a sizable local market and long-term consistency (or predictability) with respect to market development. Second, **developing an integrated strategy** that aligns industrial policy with education and R&D policy, offering targeted measures for industrial upgrading and business linkages, is necessary – existing industrial development efforts are likely to fall short of creating a competitive solar energy sector without a strategy that offers a road map for integrating different inter-dependent measures.

Our findings highlight that opportunities exist for Morocco to expand its capabilities in several market segments for solar energy: CSP, PV, SWHs and SWPs. The policy actions needed to support industrial development in these market segments vary. Whereas for CSP long-term market predictability, export opportunities and the enhancement of knowledge and R&D capabilities through business linkages are critical, PV, SWHs and SWPs require policy interventions related mainly to reforming energy subsidies, improving quality standards and identifying financing mechanisms to support consumers. In our analysis we also assess the effectiveness of existing policies and programmes and identify good practices within the private sector in Morocco and abroad that can serve as learning platforms for enhancing competitiveness. Lastly, we propose an approach for developing an integrated strategy for the solar energy sector and an institutional mechanism for systematic implementation.

The rest of the study is structured as follows: Chapter 2 introduces our analytical framework by discussing the concept of inclusive competitiveness and the relevance of business linkages for achieving this goal. In Chapter 3, we provide the general background of Morocco's economy and society as well as its RE plans. In Chapter 4, we offer a brief assessment of existing capabilities with respect to solar energy industrial development. In the following chapters, we take each element of the analytical framework and we assess it in light of findings from the fieldwork and relevant literature on good practices, locally and internationally, while reflecting on policy recommendations. As such, Chapter 5 discusses venues for enhancing technological capabilities through expanding education and R&D programmes and measures for industrial upgrading. Chapter 6 examines in more detail the highly important issue of creating a market for solar energy in Morocco, without which none of the processes synthesised in our analytical framework can unfold. Then, Chapter 7 takes up the issue of mobilising private sector investment to support solar energy deployment and industrial development. In Chapter 8, we explore different mechanisms for supporting the formation of business linkages geared towards technology transfer in the emerging solar energy sector. Chapter 9 builds on these various elements and discusses how to develop an integrated strategy for the solar energy sector in Morocco and how to implement it in a systematic manner, such that long-term competitiveness of the sector is achieved and socio-economic benefits are maximised. We end with brief conclusions and rough guidelines for development cooperation agencies in Chapter 10 and provide road maps for sequencing policy actions to develop different market segments in the solar energy sector.

2 Analytical framework

In light of the existing socio-economic and energy challenges that Morocco is facing, as well as the regional and global market dynamics in the solar energy sector, we argue that policy-makers should aim for closely linking solar energy market development with industrial development. The core argument in our study is that enhancing competitiveness in the emerging solar energy sector is the goal towards which policy actions should be oriented to position Morocco as a regional and global player in this sector. In this process, expanding the social and economic benefits – with respect to employment creation, enhancing domestic capabilities and integrating local firms in the value chain for this technology – is critical. This process should be guided by an overarching development strategy based on multi-stakeholder coordination and a comprehensive road map that can guide systematic implementation. We approach the integration of these policy goals through the concept of inclusive competitiveness.

Below we explain in more detail how we define inclusive competitiveness, why this concept suits our analysis, and what the factors and processes are that contribute to achieving this outcome.

2.1 Inclusive competitiveness

In the context of progressing towards global economic integration and participation in international trade flows, domestic markets in developing countries are increasingly exposed to global competition. Not only the export sector but also all national producers of tradable goods and services have to compete with international enterprises. Thus, being competitive, at national and international levels, has increasingly become a necessity for developing countries to sustain economic growth (Altenburg 2007, 4; Wignaraja 2002, 5).

Competitiveness is commonly defined by either referring to the national or the firm level. In its frequently cited definition, the Organisation for Economic Co-operation and Development (OECD) refers to both perspectives:

> *In microeconomics, competitiveness refers to the capacity of firms to compete, to increase their profits and to grow. It is based on costs and prices, but more vitally on the capacity of firms to use technology and the quality and performance of products. At the macroeconomic level, competitiveness is the ability of a country to make products that meet the test of international competition while expanding domestic real income.* (OECD 1992, 237)

Yet, for the purpose of our project, this definition of competitiveness is too narrow. Competitiveness in terms of price and/or quality of products relative to other international competitors in a market (Mytelka 1999, 11) can be established in a country such as Morocco by simply relying on international investment, experts, and imported components and services. A strategy for achieving competitiveness in its classic definition would not necessarily have to include developing local industrial capacities or creating employment but could entirely rely on international inputs.

The Moroccan government has, however, attached specific socio-economic expectations to its solar energy targets that go beyond this narrow notion of competitiveness: by strengthening the capacities of local companies all along the value chain and enabling them to generate value added, local employment opportunities as well as infrastructure should be enhanced (MASEN 2011b; MEMEE 2011, 34). Competitiveness of the emerging solar sector should, therefore, not be a goal in itself but also a means of enhancing local capabilities and creating socio-economic benefits, while at the same time spurring the transition to a low-carbon economy.

For our analysis, we thus focus on **inclusive competitiveness,** understood as not only the ability of local firms to compete with international enterprises in terms of price and/or quality. By specifying that competitiveness has to be inclusive in nature, we put greater emphasis on: (a) the importance that socio-economic outcomes such a development have for the local population and the domestic economy; and (b) the broad participation of stakeholders in the decision-making process.

Although the term "inclusiveness" has been increasingly used in the past few years by the development and sustainability communities, its application to different concepts such as growth and development does not seem to converge towards a common definition. Table 1 offers an overview of the various definitions or explanations of inclusiveness in different contexts from the main international development organisations. Although all the definitions refer to a development process that results in a broader set of benefits for the larger population, we can notice variations in how each of these organisations view this concept, with respect to both outcomes and process (i.e. what type of benefits should be emphasised, how participatory the development process should be, and what scope of inclusiveness is considered).

Our perspective on inclusiveness is in line with UNDP (2013), which stresses the importance of participation and benefit-sharing in both the process and outcomes of the development process. The benefit-sharing would mean that employment opportunities at different levels are created for a larger share of the population, and that equitable income distribution is achieved. To this, we add the private sector dimension with respect to enhancing capabilities among local firms and integrating local companies in regional and international value chains. At the same time, given that solar energy and its applications cut across various sectors of the economy (e.g. agriculture, housing, manufacturing), broad stakeholder participation (from government to civil society) is necessary for identifying the right policy levers and for overcoming vested interests. Further, public awareness and acceptance is critical. As such, competitiveness in the emerging solar energy sector is inclusive only if it is achieved by creating employment, initiating infrastructure investments, giving opportunities for companies to upgrade production processes and services through transfer of technology and skills, and if it is based on multi-stakeholder consultation and participation. We argue that such a process is likely to have a transformative impact, not only on the energy system but also on the larger economy and society, creating opportunities for a new social contract.

Table 1: Common definitions of "inclusiveness" [5]

Institution	Definition
Asian Development Bank	**Inclusiveness** *"refers in some sense to the* ***distribution of well being****, however measured. A given average for a population can be distributed in an infinite number of ways, ranging from perfect equality to extreme equality. And we can evaluate this distribution in a number of different ways, depending on what specific social welfare function is used in evaluating individual well being and then aggregating the evaluation to a social level.* (…) *For a given level of average income, inclusiveness can be measured simply by the degree of poverty. As for changes in average income, growth, its* ***inclusiveness can thus be measured by the change in poverty****. Specifically, we can calculate poverty change per unit of increase in per capita income, convert this into an elasticity, and use this as a measure of the inclusiveness of growth.* (…) *Using these definitions, we might say that* ***inclusive growth is necessarily pro-poor****, but non-inclusive growth (in the sense of inequality increasing with growth) is not necessarily anti-poor, provided it is not 'too' non-inclusive (ie the inequality rising effect does not dominate the growth effect on poverty).*

5 Emphasis added.

Institution	Definition
Asian Devel-opment Bank	*However, making the same rate of growth more inclusive (inequality falling more or not rising so much) must make that growth more pro-poor. And, since there is a range of possibilities for distributional change associated with any given growth rate, inclusiveness itself can be more or less pro-poor – certain types of inequality decrease (for example those that increase middle level incomes) reduce poverty by less than other types of inequality decrease (for example, those that increase the lowest incomes). To summarize on income, therefore, the focus of policy for poverty reduction must be growth with as much inclusiveness as possible, and with as much inclusiveness of the poorest as possible."* (Rauniyar 2010)
European Report on Development	*"The notion of* ***inclusive and sustainable growth*** *makes explicit both the environmental and the social dimensions of development. Growth is crucial for development, but when it addresses social and environmental concerns it is more likely to achieve human wellbeing.* (...) *Inclusiveness is about the participation of current generations in sharing the world's wealth. Inclusiveness is important because all human beings should have the same rights and opportunities to develop their full range of capabilities.* (...) *Inclusiveness is not limited to income inequalities but can include non-income aspects of wellbeing, such as access to education, or access to land, energy and water. Inclusive and sustainable development refers to both process and outcomes."* (ODI / ECDPM / DIE 2012)
ILO/UNCTAD/ UNDESA/WTO	***"Inclusive growth*** *provides broadly shared opportunities to accumulate productive assets like education, allows people to utilise these assets in growth-enhancing activities and benefit from such activities, and provides for those that do not benefit directly from growth."* (UN System Task Team on the post-2015 UN development agenda 2012)
OECD	*"**Inclusive growth*** (…) *combines strong economic growth with improvements in living standards and outcomes that matter for people's quality of life (e.g. good health**, jobs and skills**, clean environment, community support)."* (OECD 2013a)

Institution	Definition
UNDP	*"IPC-IG's work on **inclusive growth** starts from the premise that societies **based on equality** tend to perform better in development. For instance, countries with more equal income distribution are likely to achieve **higher rates of poverty reduction** than very unequal countries. Inclusive growth is both an outcome and a process. On the one hand, it ensures that everyone can participate in the growth process, both in terms of decision-making for organising the growth progression as well as in participating in the growth itself. On the other hand, it makes sure that everyone shares equitably the benefits of growth. Inclusive growth implies **participation and benefit-sharing**. Participation without benefit sharing will make growth unjust and sharing benefits without participation will make it a welfare outcome."* (UNDP 2013)
World Bank	*"**Inclusive growth** refers both to the pace and pattern of growth, which are interlinked and must be addressed together. Rapid pace of growth is unquestionably necessary for substantial poverty reduction, but for this growth to be sustainable in the long run, it should be broad-based across sectors, and **inclusive of the large part of a country's labor force**. This definition implies a direct link between the macro and micro determinants of growth."* (World Bank 2012b)

When aiming for competitiveness and socio-economic inclusiveness, certain trade-offs become evident; every policy decision involves choices of specific development pathways characterised by both benefits and challenges. For instance, different solar technologies offer different advantages and disadvantages in terms of creating inclusive competitiveness. Thus, promoting one over the other inevitably includes certain trade-offs. PV and SWHs, for example, offer more employment opportunities and are less costly in the short term, but they also lack innovation and export potential. CSP, on the other hand, offers fewer employment opportunities and needs significantly more initial investment, but, in the long term, it offers export potential and, thus, can bring export revenues into the country that could be reinvested in local development. Furthermore, the storage potential could alleviate electricity shortage as being a limiting factor for local production. In addition, trade-offs are also involved in opting for inclusive competitiveness as a policy goal, since competitiveness could be achieved more quickly and at a lower cost by simply attracting foreign direct investment (FDI) and foreign companies (i.e. leading firms) that develop solar plants without local involvement. Yet, when the goal is to create employment effects and other positive spillovers for the local industry, this process will be slower and require further investments from the government in order to overcome market failures and to support domestic companies in catching up and entering the value chain for solar technologies. From another point of view, as employment creation is such an urgent goal for most developing countries, trade-offs occur with respect to investing in enhancing labour productivity and aspiring for technological progress in production processes, or opting for labour-intensive industrial sectors where the amount of labour per unit of capital is the highest. Some of these trade-offs became more evident when discussing the challenges of deriving opportunities for local development from the construction of the largest CSP plant worldwide in Ouarzazate (see Chapter 4).

Yet, as it is the explicit goal of the Moroccan government to couple the development of solar energy with socio-economic benefits, an integrated strategy is needed that combines the different policy choices in order to derive the most benefits possible. This could entail combining complex technologies with a high potential for capability-building and knowledge spillovers, such as CSP, with low-tech solutions that offer larger employment benefits. This has to be taken into account when deriving recommendations for enhancing inclusive competitiveness in the emerging solar energy sector in Morocco.

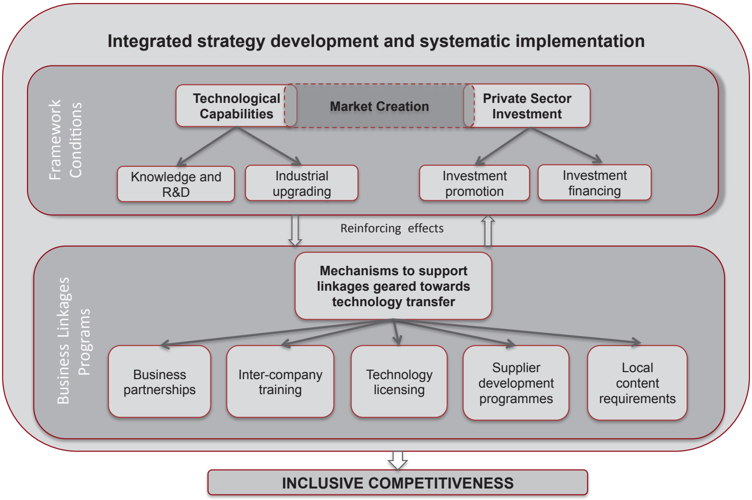
2.2 Achieving inclusive competitiveness in the emerging solar sector

To achieve inclusive competitiveness, we highlight that two main sets of factors are necessary (see Figure 1), which constitute the building blocks for the development of the solar energy sector:

1. certain framework conditions for the development of the local industry need to be in place;
2. business linkages have to be fostered and geared towards technology transfer.

Further, to achieve the expected outcomes, policy measures should be integrated within an industrial development strategy to be implemented in a systematic approach.

Figure 1: Analytical framework



Source: Own illustration

First, certain **framework conditions** are needed with respect to local technological capabilities, private sector investment and market size. **Technological capabilities** are critical for enhancing competitiveness, as local companies have to be able to learn, internalise and utilise management skills and technological knowledge (UNCTAD 2010). Such capabilities are acquired through knowledge creation (education and training) and expansion of basic and applied research in close cooperation with the private sector, which is critical for supporting innovation. As the recent *Manufacturing for Growth* report highlights, policies that promote superior science and technology research and development that is focused on advanced manufacturing are essential for competitiveness (WEF 2013b). In addition, firm-level industrial upgrading programmes are needed to enable firms to create and implement innovation and enhance products, processes and organisational structures. Such programmes support local companies in becoming attractive partners for more experienced firms (i.e. leading technology firms or transnational companies) and enable them to benefit from spillover effects (Altenburg 2000, 35).

Given the high capital intensity of solar energy, another framework condition necessary for the development of a sector is **private sector investment**. High levels of investment are needed to boost solar electricity generation as well as to support the development of a local industry. To this end, it is critical to mobilise investment through targeted investment-promotion and facilitation measures as well as to identify financing mechanisms locally and internationally.

However, a critical condition for both acquiring a basic level of technological capabilities and for attracting private sector investment is the presence of a **sizable and visible market** for solar energy in Morocco. Without creating a domestic market for solar energy, various stakeholders, locally and internationally, cannot find a justification for engaging in the emerging solar energy sector. A stable market with long-term predictability (or consistency) is critical, not only for giving the right signals to potential foreign investors; it is also a highly important and necessary condition for local companies to acquire experience and expertise domestically and to engage in export markets.

A second main aspect of enhancing competitiveness in the emerging solar energy sector is the creation of **business linkages** between domestic and foreign firms. Competitiveness of countries and enterprises depends to a great extent on their ability to tap international sources of knowledge as well as on their ability to absorb and use it to deploy resources more efficiently (Altenburg, 2005, 21). These critical sources of knowledge include managerial skills, finance and technological know-how. One of the best ways to access those resources and produce higher value-added goods and services is to establish business linkages between TNCs and local SMEs (Altenburg 2005; UNCTAD 2000). In their cooperation with local SMEs, TNCs also tend to define product and process standards and to enforce them throughout the supply chain, thus forcing their local partners to upgrade (Altenburg 2005, 5). Hence, business linkages are crucial to providing local companies with the necessary assets and incentives to increase competitiveness and overall productivity (UNCTAD 2010, 9, 15), while also contributing towards attracting private sector investment. The reinforcing relation between framework conditions and business linkages is represented in our analytical framework.

Various business linkages exist between large and small firms in (and within) developed and developing countries. The type of business linkages that we are most interested in are those between TNCs from developed countries and local SMEs in developing countries (see Box 3). TNCs have easier access to international best practices, leading markets and new technologies and are gatekeepers to markets. In contrast, SMEs can provide contacts to local customers and decision-makers; they have knowledge about the local market and special preferences (Altenburg, 2000, 2005). As a result, business linkages can be beneficial to both sides.

Box 3: Business linkages between TNCs and local partners

There are mainly four types of business linkages of TNCs with local partners: backward linkages with suppliers, linkages with technology partners, forward linkages with customers and other spillover effects (UNCTAD 2010). Backward linkages form when TNCs draw on local suppliers for services, materials, parts or components. Linkages with technology partners occur when a TNC engages in licensing agreements, joint ventures or strategic alliances with local companies (UNCTAD 2010, 16). This can either occur because the partners anticipate mutual benefits from such joint projects and governments removing obstacles for such projects or because specific local content rules require TNCs to engage with local partners (UNCTAD 2006, 4). Forward linkages with customers are formed when TNCs that produce certain inputs offer after-sale services to industrial buyers or in case they source out the distribution of their brand name products through marketing outlets. Other spillover effects refer to human capital spillovers through training provided by a TNC and demonstration effects (UNCTAD 2000, 4ff.; UNCTAD 2010, 16).

Business linkages are most likely to generate positive spillover effects if the technology gap between the partners is relatively small. Therefore, business linkages are more frequent in the production of labour-intensive consumer goods than in knowledge-intensive technologies (UNCTAD 2010, 16). Creating linkages in cutting-edge technologies is thus a challenge that, so far, only a few developing countries have been able to master, most prominently in South-East Asia in sectors such as electronics (Ruffing 2006, 14).

Various policy mechanisms for fostering business linkages geared towards technology transfer are important: business partnerships, inter-company training, technology licensing, supplier development programmes and local content regulations. Orienting these policy mechanisms towards local employment creation and embedding local enterprises in the value chain for solar energy is likely to contribute towards achieving inclusive competitiveness. These measures are generally part of the industrial policy toolbox. To apply industrial policy tools, several principles have been identified as relevant for policy-makers, such as embeddedness, a system of "carrots and sticks" and accountability (see Box 4).

Box 4: Key industrial policy principles in developing countries

Given that there is both an empirical and a theoretical case for industrial policy, the question is therefore not *if* industrial policies should be used but *how* they should be implemented.

Rodrik (2009, 19) articulates some general principles on how to design institutions carrying out industrial policies in order to overcome possible government failures. These principles follow certain considerations: the fact that knowledge about spillovers, market failures and constraints is diffused widely in the economy requires that industrial policy be "embedded" within the society. The fact that businesses have strong incentives to "game" the government calls for strong safeguards against bureaucratic capture. In addition, since the society is the intended beneficiary – and not certain bureaucrats or business – there is a strong need for accountability.

Considering the principle of embeddedness, Rodrik refers to Evans' concept of "embedded autonomy" (Evans 1995) and argues that the right model for industrial policy consists *"of strategic collaboration and coordination between the private sector and the government with the aim of uncovering where the most significant bottlenecks are, designing the most effective interventions, periodically evaluating the outcomes, and learning from the mistakes being made in the process"* (Rodrik 2009, 20). Specific mechanisms for this could be, among others, deliberation councils, supplier development forums or sectoral round tables.

In addition, the successful implementation of industrial policy requires a system of *"carrots and sticks"*, which on the one hand encourages investments in non-traditional areas, but on the other hand sorts out projects that fail. Therefore, *"conditionality, sunset clauses, built-in program re-*

views, monitoring, benchmarking, and periodic evaluation are desirable features of all incentive programmes" (Rodrik 2009, 22) and facilitate the phasing-out of unsuccessful programmes. Every self-discovery involves a risky process of trial and error, but the important question is not if the government is able to *"pick winners and losers"* but if it is able to let go of the losers (Rodrik 2009, 22).

The last principle relates to the accountability of the bureaucrats towards their "principal", namely the public. Rodrik (2009, 23) argues that accountability can be fostered by raising the political profile of industrial policy, giving clear mandates to individual agencies and generally strengthening the transparency of industrial policy measures.

The third building block for achieving inclusive competitiveness in the emerging solar energy sector in Morocco is the development of an integrated strategy and its systematic implementation. Identifying a road map for developing the solar energy sector in Morocco through strategic policy coordination is critical, and hence an important component of our study. Such a strategic approach should pursue the assessment of binding constraints to the development process, integrate mechanisms for stakeholder consultations, and emphasise learning and flexibility to adapt to constant changes in regional and global market conditions.

3 Morocco and its emerging solar energy industry

3.1 Socio-economic development in Morocco

Morocco, a constitutional monarchy under the leadership of King Mohammed VI, has proven to be one of the most stable economies in the MENA region following the Arab Spring uprisings of the past few years. This stability masks, however, deep challenges faced by the current regime to maintain its political supremacy and strong role in the economy, while at the same time increasing the distribution of benefits to the larger population. Although economic progress has improved, these outcomes have not trickled down to the majority of the Moroccans, as unemployment and high inequality persists (AfDB 2011b).

Morocco has recorded sound economic growth rates in the last decades, with average annual GDP growth of around 5 per cent (World Bank 2013b). The industrial sector has also been growing by an average of 3.5 per cent annually (World Bank 2013b). The proximity to Europe has boosted steady economic growth, in addition to the Advanced Status Agreement with the EU, which expanded trade links between Morocco and EU countries. Yet, as a lower-middle-income economy, Morocco is confronted with various socio-economic development challenges, especially in the face of the global financial crisis, increased global competitive pressures and fast-paced technological development.

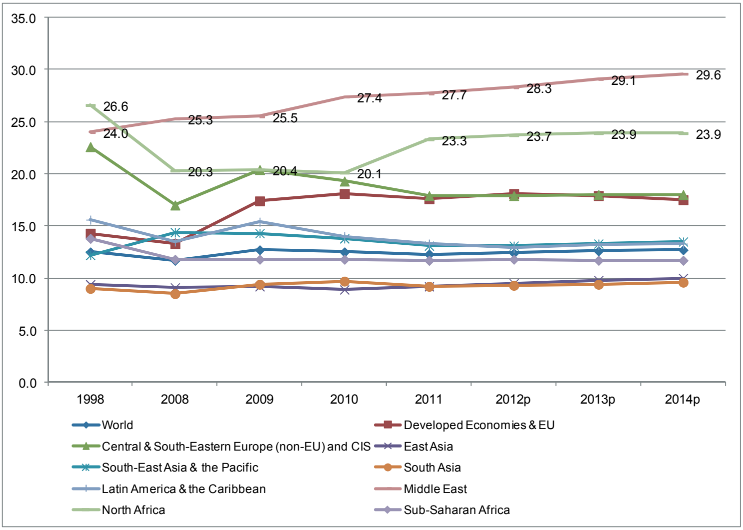
High unemployment and a growing income gap are of particular concern in light of an increasing population (on average 1.4 per cent yearly) and a growing share of the working-age population (currently about 35 per cent of the total population) (World Bank 2013b). Even though total unemployment in Morocco declined in recent years, reaching 8.9 per cent in 2011 (Haut-Commissariat au Plan du Maroc 2012), 17.1 per cent of the youths aged 15 to 24 are still jobless (World Bank 2013b). Moreover, unemployment is especially high among youth with university degrees, as in other countries in the MENA region. Unemployment rates are much higher here than in other regions in the world (see Figure 2), reaching almost 30 per cent in the Middle Eastern countries and 24 per cent in the North African countries.[6]

At the same time, although the overall access to education has improved, a mismatch between the supply and demand of skills persists, especially with respect to higher education and vocational training (AfDB 2009, 4). This outcome is primarily due to a low level of cooperation between the private sector and education institutions (IFC 2011, 42–43) and an emphasis on theoretical rather than practical knowledge in vocational training programmes (IFC 2011, 13). In addition, a growing trade deficit[7] challenges national financial sustainability, while limited industrial competitiveness and innovation capabilities (WEF 2011a) pose concerns for long-term growth.

6 Unemployment statistics are difficult to interpret, as the problem is often disguised in underemployment and unproductive employment. Nevertheless, it suffices to say that the above data point to severe problems in the labour market across the entire MENA region.

7 Among the imported goods, oil and coal make up a large share – due to Morocco's limited natural resources, aside from phosphates.

Figure 2: Youth unemployment in the MENA region in 2010 (per cent)



Source: ILO (2011a, 2013)

Morocco's relative performance with respect to competitiveness has decreased over the past three years (see Table 2), while countries such as Egypt and Algeria – although positioned lower in the Global Competitiveness ranking – have improved.

Table 2: Global competitiveness rankings in selected countries

	2012–2013 (out of 144)	2011–2012 (out of 142)	2010–2013 (out of 139)
Morocco	70	73	75
Algeria	110	87	86
Egypt	107	94	81
Turkey	43	59	61
Spain	36	36	42
France	21	18	15
Germany	6	6	5

Source: WEF (2013a)

To understand what factors have contributed to this decline in competitiveness in Morocco, Table 3 delves deeper into the determinants of competitiveness and shows the deeper-rooted causes of its limited level of competitiveness. Morocco ranks particularly low with respect to labour-market efficiency; higher education and training; business sophistication; and innovation. It is noteworthy that Morocco's rankings in some categories have worsened in the last years and that the macroeconomic environment has deteriorated, with Morocco dropping from 25 to 70 – even though the government and its respective institutions have put a lot of effort into creating a positive environment for investment and private sector development.

From the perspective of the emerging solar energy sector, the issue of a limited level of competitiveness in Morocco should be tackled from various angles, which are presented in the next chapters, namely: improving the education and research sector (Chapter 5); expanding and targeting industrial upgrading programmes (Chapter 5); creating a market for solar energy (Chapter 6); mobilising private sector investment (Chapter 7); fostering business linkages to achieve technology transfer and innovation (Chapter 8); and developing a strategy that allows for an integrated development approach to these issues (Chapter 9).

Table 3: Global Competitiveness Index rankings for Morocco, by the 12 competitiveness pillars

	2012–2013 (out of 144)	2011–2012 (out of 142)	2010–2011 (out of 139)
Basic requirements	**68**	**54**	**64**
– Institutions	54	59	66
– Infrastructure	61	69	71
– Macroeconomic environment	70	25	31
– Health and primary education	81	93	94
Efficiency enhancers	**79**	**83**	**88**
– Higher education and training	101	98	102
– Goods-market efficiency	69	76	77

– Labour-market efficiency	122	132	130
– Financial market development	63	62	74
– Technological readiness	75	66	75
– Market size	57	57	57
Innovation and sophistication factors	**84**	**79**	**79**
– Business sophistication	81	80	78
– Innovation	97	80	81
Source: WEF (2011b, 2012, 2013a)			

Morocco has shown commitment to extensive reforms – boosting economic growth, lowering unemployment, increasing efficiency in government spending, attracting foreign investment, and establishing a competitive business environment are among the main commitments the Moroccan government has made (IMF 2011, 4–6). Three main national-level initiatives are particularly important: the National Pact for Industrial Emergence (Le Pacte National Pour l'Emergence Industrielle), the Moroccan Innovation Initiative (Initiative Maroc Innovation), and the National Energy Strategy (La Stratégie Energétique Nationale), including Plan Solaire.

The National Pact for Industrial Emergence (hereafter Le Pacte) of 2009 aims to raise the competitiveness of Moroccan SMEs in various sectors, especially the automobile, aerospace, electronics, food-processing and textile industries. Promoting exports and investment, establishing adequate training opportunities and improving the general business climate are goals to be fulfilled through Le Pacte. The energy sector is currently only marginally targeted by Le Pacte. However, it has proven to be successful in other sectors, especially in the automobile, aerospace and electronics sectors. In the automobile sector, Renault is the key player in Morocco, with 80 years of experience and two large production plants in Casablanca and Tangier. The relatively new industrial complex in Tangier, built in 2008, is one of the achievements of the incentives set by Le Pacte. The decision to move to Morocco was due not only to its proximity to Europe and the gate to southern Africa, but also to the support of the government, good infrastructure conditions and fiscal competitiveness (AMDI 2013a). In the aerospace and electronics sectors, Le Pacte has attracted a vast number of companies to start operating in Morocco. From the 60 companies active in the aerospace sector, almost 70 per cent have been in operation less than five years (AMDI 2013b). Companies in the electronics sector are increasingly upgrading their portfolios in Morocco – with simple subcontracting operations being upgraded to responsibilities in design and engineering. The incentive framework, which offers tax exemptions and support in human resources and infrastructure, was among the main reasons given to settle in Morocco (AMDI 2013b). All the sectors have shown progress in the past years with strong growth rates and by attracting more FDI. However, a comprehensive strategy targeted towards rising growth rates, tapping into higher value-added products and maintaining competitiveness through innovation and entrepreneurship is still lacking.

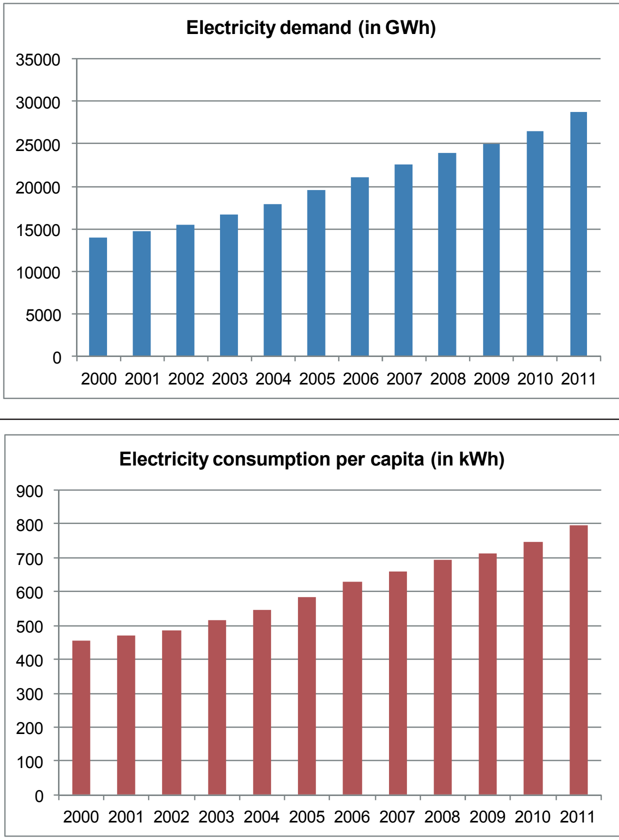
Recognising the importance of innovation capabilities for achieving global competitiveness, the Moroccan Innovation Initiative was launched in 2009. Firstly, the initiative aims at improving the domestic technological and valorisation infrastructure as well as setting up clusters and 14 so-called Cities of Innovation by 2016. These cities shall facilitate the commercialisation of research and technology transfer in various sectors. The plan is for the cities to also serve as incubators, offer support services for innovative companies, serve as value-added centres, increase the research contracts between firms and universities, and have market-oriented R&D and technology-transfer offices (MCINET 2012). Further, other elements that shall support innovation in Morocco are increasing the availability of research funds, mobilising talent by promoting an innovative culture and developing an intellectual property market. Finally, all these measures have the concrete goal to produce 1,000 Moroccan patents and create 100 innovative start-ups a year, starting in 2014 (MCINET 2012). The outcomes from this innovation initiative can, as of yet, hardly be seen beyond a couple of programmes targeted at firm-level innovations (discussed in more detail in Chapter 5).

The National Energy Strategy aims to address the energy security challenges posed by the rising energy demand and extreme reliance on energy imports. At the core of the strategy is the increasing role that renewables are expected to play in the energy mix in Morocco. In the next sections, we discuss why renewable energy is important for Morocco, what the National Energy Strategy aims to achieve and who the main stakeholders are in the emerging solar energy sector.

3.2 Morocco's energy sector

Morocco's electricity demand increased by a yearly average of 6.8 per cent between 2000 and 2011, and electricity consumption per capita increased by an average of 5.2 per cent per year (see Figure 3). Projections even show that consumption will double by 2020 and quadruple by 2030 (MEMEE 2011).

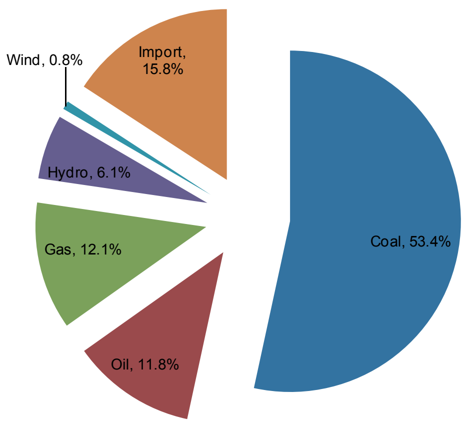
Figure 3: Electricity demand and electricity consumption per capita in Morocco



Source: ONEE (2012)

Increasing electricity demand is not a problem in itself. But Morocco is heavily dependent on energy imports, since only 1 per cent of the fossil fuels consumed are produced domestically (GIZ 2012b, 1; RCREEE 2010, 4). In 2011, imports covered 95 per cent of Morocco's overall energy needs (World Bank 2012a). As Figure 4 shows, fossil fuels currently dominate the electricity production mix: only 7 per cent of electricity production stems from RE in the form of wind (1 per cent) and hydropower (6 per cent). Morocco imports most of its net electricity from Spain and Algeria – 15 per cent originated from Spain in 2010 (LOG 2010). Spain and Morocco are connected through a 400 kV submarine AC cable that can transfer up to 700 MW – which is both important for importing energy and also for potential exports in the future. Algeria and Morocco share three connections: a 400 kV circuit overhead line and two 220 kV overhead lines that transport up to 1,400 megawatts (MW), from Bourdim to Hassi Ameur, and Oujda to Ghazaouet and Tlemcen, respectively (PWMSP 2012b, 14).

Figure 4: Electricity production in Morocco



Source: ONEE (2012)

This dependency on energy imports makes Morocco highly vulnerable to increases in international fuel prices, putting a heavy fiscal burden on the national budget. On the one hand, the country's energy bill – reaching an unprecedented level of 90 billion Moroccan dirham (MAD) in 2011 (about US$ 10bn), burdens the country's trade balance (Shamamba 2012). On the other hand, rising prices strain the state budget significantly as the government increases subsidies on energy to keep domestic prices stable in light of volatile international prices (CTF 2009, 3).

The National Energy Strategy, elaborated in 2008, seeks to ensure a secure and sustainable energy supply by exploiting additional domestic energy resources (i.e. RE resources) as well as by reducing the overall demand through promoting energy efficiency (MEMEE 2011). Below we examine the RE plans that are part of the energy strategy.

3.3 Morocco’s renewable energy potential and targets

In spite of its vast solar and wind energy resources (see Table 4), Morocco has so far only tentatively developed RE capacities. A total of 291 MW of

Table 4: Renewable electricity performance indicators for selected MENA countries and southern European countries

	Global Horizontal Irradiance[8] (kWh/m²/y)	Direct Normal Irradiance[9] (kWh/m²/y)	Wind – Full Load Hours per Year (h/y)
Morocco	2,000	2,600	2,708
Tunisia	1,980	2,400	1,789
Algeria	1,970	2,700	1,789
Egypt	2,450	2,800	3,015
Lebanon	1,920	2,000	1,176
Turkey	2,218	2,000	2,218
Spain	2,000	2,250	2,463
Italy	1,800	2,000	1,605
Greece	1,730	2,000	2,218

Source: DLR (2005)

8 Suitable for PV technologies.

9 Suitable for CSP technologies.

wind power capacity in four wind farms is currently installed in Essaouira, Al Koudia and Tangier, which represents the largest installed capacity after Egypt (550 MW in 2012) (REN21 2013). Regarding solar energy, so far only 20 MW capacity of CSP has been installed in the Integrated Solar Combined Cycle power plant in Ain Beni Mathar. While no PV plants larger than the 54 kW plant in Tit-Mellil are currently in place, small rooftop PV installations have been installed in remote rural areas as part of Morocco's rural electrification programme, accounting for 15 MW of installed capacity in 2012 (PWMSP 2012b; REN21 2013).

In 2008, the Moroccan government set ambitious RE targets to diversify its energy mix (see Figure 5). By 2020, 42 per cent of the installed electrical capacity is expected to be based on RE sources, thereof 2 GW of solar energy, 2 GW of wind energy and 2 GW of hydropower (MEMEE 2011). In Plan Solaire, the target is to achieve the 2 GW target by constructing five large solar power plants.

To this end, the Moroccan government has committed US$ 9 billion and has set up MASEN as an agency tasked with the implementation of the solar energy targets (see Box 5). As of now 173 MW of solar energy capacity is in the pipeline (split into three different projects) and 1,533.1 MW of wind energy (split into 12 projects) (REN21 2013).[10]

Box 5: The Moroccan Agency for Solar Energy (MASEN)

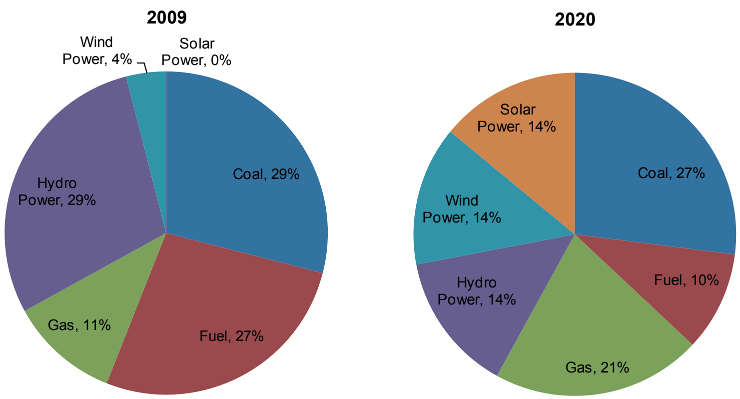
MASEN is the most important actor for the Moroccan solar energy sector. The joint stock company, with a Board of Trustees and a Supervisory Board, is independent from the Ministry of Energy, Mines, Water and Environment (MEMEE) and was created in 2010 through Law 57-09. The equal shareholders are the Moroccan state, ONEE, Fonds Hassan II and Société d'Investissements Energétiques (SIE). MASEN is responsible for implementing Plan Solaire with a minimum total capacity of 2 GW by 2020 (MASEN 2011a).

10 This would allow Morocco to save 1.5m tonnes of oil equivalent (toe) and 5.6m tonnes of emitted CO_2 per year (REN21 2013).

Its main activities include: design integrated solar projects; conduct technical, economic and financial studies; propose modes of industrial integration; project management; realise infrastructure for grid connection; programme promotion to foreign investors; and contribute to development of training modules and research and innovation. The competitive bidding procedures for the solar plants as well as the allocation of land are also carried out by MASEN. MASEN furthermore coordinates the combination of grants and loans by multilateral and bilateral donors (PWMSP 2013, 15).

MASEN currently employs 26 experienced experts and expects to grow to almost 50 employees in the future. For the development of the first phase of Ouarzazate, several advisors assist MASEN in technical, fiscal, financial, legal and managerial matters. For the managerial matters, a Project Management Office was set up to plan, manage and monitor the development of Plan Solaire and the construction of Ouarzazate.

Figure 5: Installed capacity from different energy sources in 2009 and 2020



Source: MEMEE (2011)

The first project – the CSP plant in Ouarzazate, which is the largest plant of its kind worldwide – will have a capacity of 500 MW and be completed by 2015 (MASEN 2012, 3). In the first phase of the project, 160 MW of parabolic trough technology with three hours of thermal energy storage will be installed by a Saudi-Spanish consortium led by the Arabian Company for Water and Power Projects International (ACWA Power 2012) (see Table 5). As the international financing of the project was approved in November 2011, construction is now under way. By developing the overall 2 GW installed capacity of solar power (split into five main locations), 1 million tonnes of oil equivalent (toe) and 3.7 million tonnes of emitted CO_2 could be saved annually.

Table 5: Companies involved in the CSP plant in Ouarzazate

Company	Category	Responsibility
– ACWA Power International – Aries Ingeniería y Sistemas – TSK Energía y Plantas Industriales	Preferred bidder; Consortium	Lead developer on "Build, Own, Operate and Transfer" basis
– TSK Electrónica y Electricidad – Acciona Infrastructuras – Acciona Ingeniería – Sener Ingeniería y Sistemas	Consortium	Engineering, Procurement and Construction
– NOMAC (subsidiary of ACWA Power)	Consortium	Operation and Maintenance

Source: Own illustration based on ACWA Power (2012)

Aside from the power generation sector, the application of solar energy technologies to the heating and cooling sector, such as with solar water heating, has a high potential in Morocco and in other countries in the MENA region. Given its low user cost, simple technology and quick payback period, solar water heating is a "low-hanging fruit" of solar energy (REN21 2013, 13). In addition, solar water heating can contribute to localising benefits with respect to local manufacturing and employment creation. However, in spite of earlier efforts to promote solar water heating deployment, the market in Morocco remains underdeveloped (see Table 6). The national target is to have 1.7 million m^2 of collector area by 2020, the programme for which is expected to create 13,000 new jobs (REN21 2013).

Table 6: Solar water heating installed capacity in the MENA countries

	Total capacity (MW_{th})	Total collector area (m^2)
Algeria (2012)	0.21	300
Egypt (2012)	525.0	750,000
Libya (2012)	0.021	30
Syria (2012)	420.0	600,000
Israel	2,917.8	4,168,245
Jordan (2012)	350.0	500,000
Lebanon (2012)	245.0	350,000
Malta (2011)	36.0	51,360
Morocco (2012)	245.0	350,000
Palestinian Territories (2012)	1,120.0	1,600,000
Tunisia (2012)	437.5	625,000

Source: REN21 (2013)

Solar water pumps, mainly used in the agricultural sector, are also high on the agenda in terms of RE development. In June 2013, the government mobilised 400 million MAD (approximately 36 million EUR) for a new solar pumping programme. It is intended to enable small and medium-sized agricultural farms to pump up water powered by PV panels, thereby reducing the overuse of butane and improving energy efficiency. MEMEE and the Ministry of Agriculture, the two responsible ministries, hope to generate more income for the farmers due to lower electricity generation costs and, hence, reduce subsidies on butane, which are hampering the development of SWPs. About 3,000 SWPs, with a cumulative capacity of about 15 MW, will be installed across Morocco (Xinhua 2013). The installation and maintenance will create jobs and reduce energy consumption in the agricultural sector, which is responsible for 13 per cent of overall energy consumption (Xinhua 2013).

In order to reach its 2020 RE target, the Moroccan government has also taken first steps in creating a legal and institutional framework to support the creation of a local market for RE. Laws were adopted that allow RE sources (for medium- and high-voltage projects) to access the electricity network and open up competition in the RE sector (i.e. Law 13-09). Although the national utility, the Office National de l'Électricité et de l'Eau Potable (ONEE), owns the transmission grid and the majority of the distribution grid (with a 45 per cent stake in the domestic market), Law 13-09 permits power plants with capacities up to 50 MW to be built and operated by private enterprises. ONEE is the Moroccan public utility that has been responsible for providing national electricity services since 1963. ONEE produces Morocco's energy together with three independent power producers and operates as a single buyer. It owns the entire transmission network, which amounts to nearly 19,000 km. ONEE handles the retail sale of electricity to final consumers for most of the country, while seven local municipal authorities manage electricity distribution themselves or by commissioning private companies. ONEE is also responsible for the implementation of the 2 GW wind energy target. In addition, three supporting bodies were created to assist in the development, research as well as financing of RE projects: ADEREE (set up by Law 16-09); MASEN (set up by Law 57-09); and SIE.

ADEREE is directly overseen by MEMEE. It resulted from the restructuring of the Center for Development and Renewable Energies (CDER), established in 1982. ADEREE was founded in 2009 to contribute towards implementing the Moroccan government's Renewable Energy and Energy Efficiency policy. ADEREE is mainly responsible for the preparation of plans, maps and resource assessments with a specific focus on wind power. Furthermore, it makes proposals for project sites and incentive frameworks; initiates pilot projects with the goal of spreading knowledge about the implementation of renewable energy technologies as well as to demonstrate the viability of renewable energies and efficient energy solutions; performs quality-control checks (in particular on PV equipment); and trains specialists in the renewable energy sector. SIE was set up in 2010. SIE manages the Energy Development Fund, which was endowed with US$ 1 billion (of which 500 million is from the Kingdom of Saudi Arabia, 300 million from the United Arab Emirates and 200 million from the Hassan II Fund for Economic and Social Development), and seeks to mobilise further capital within and outside

Morocco's borders. Investments are made in three focal areas: (1) increase energy production capabilities, (2) reinforce renewable energy resources, and (3) strengthen energy efficiency. SIE works in close cooperation with actors such as ONEE (when it comes to wind power), MASEN (solar power) and ADEREE (energy efficiency). The company is also in charge of the anticipation of trends and the identification of investment opportunities.

Furthermore, the Ministry of Industry, Trade and New Technologies (MCINET) has introduced a package of incentives to support the development of the RE sector (see Chapter 7 for a more detailed discussion). MCINET plays an important role in promoting industrial development in the renewable energy sector. It has done so against the backdrop of issuing Le Pacte in 2009 to strengthen the Moroccan economy *"so it can expand into new industry niches using innovative technologies and have promising markets for its products and services"* (MCINET 2009). In the original Le Pacte, RE only played a minor role. Thus, under the Framework Convention on the Support for Industrial Investment in Renewable Energies and Energy Efficiency, MEMEE and MCINET integrated RE into the energy and industrial sector strategies. MEMEE plays the central role with regards to renewable energy. Its primary responsibility is to address energy security and ensure access to energy for both rural and urban populations. It also oversees the functioning of the energy market, and elaborates and implements strategies for developing the energy sector. Within MEMEE, the Directorate for Electricity and Renewable Energies plays an important role with regards to renewable energy, especially when it comes to developing the legislation and regulation for electricity and renewable energy. It oversees divisions responsible for electrical equipment and rural electrification, distribution and electric markets as well as renewable energies and nuclear safety. The Directorate for Observation and Planning is another important ministerial division, responsible for the elaboration of national energy policies.

Although the legal and institutional framework is already advanced, only tentative incentives for local market development have been implemented (see Chapter 7). To date, the Moroccan private sector has limited capabilities and capacities regarding RE. Only a few of the components, especially for CSP, can be produced locally (World Bank 2011). As a case in point, local firms are not yet involved in the development of the first phase of the Ouarzazate CSP plant in areas other than construction and maintenance. For Moroccan enterprises to profit from the economic dynamics of the country's RE targets, they have to gain experience and capabilities all along the value chain. Incentives and support for local market development are currently needed, as local companies are not capable of competing with international suppliers. Up to now, there have been two small-scale programmes that have enabled Moroccan companies to gain experience in RE technologies: PERG and the Projet de Développement du Marché Marocain des Chauffe Eau Solaires (PROMASOL), a programme to promote the use of SWHs in Moroccan households.

The Moroccan authorities initiated PERG in 1996 in order to provide all Moroccan households with electricity by 2010. It was successful in expanding the electrification rate from 15 per cent in 1996 to 98 per cent in 2010 (RCREEE 2010, 19). While this was achieved in 90 per cent of the cases via the connection of rural households to the general grid, 10 per cent of households received decentralised electrification by installing PV systems on their rooftops. Up to 2011, approximately 60,000 PV systems had been installed with a total capacity of 4 MW (PWMSP 2011, 10; RCREEE 2010, 19). This second component of PERG was intended to spread the use of RE and allow local enterprises to gain experience with the production and installation of small PV systems.

In 2002, PROMASOL – an integrated SWHs and PV support project – was initiated by MEMEE and managed by CDER (which later was transformed into ADEREE) in order to promote the local market for SWHs (and to a lesser extent PV) (PWMSP 2013, 16). To achieve this goal, improving the quality of SWHs, raising awareness among the public and giving incentives to buy SWHs as well as training and certification of SWHs installers were envisaged. During its implementation, the number of SWHs installed by Moroccan households increased from approximately 35,000 m^2 of solar panels in 1998 to more than 350,000 m^2 by 2012 (REN21 2013, 14). According to a case study of the UNDP-led Growing Inclusive Markets Initiative, the number of companies that import and/or manufacture SWHs increased from 5 to more than 40 (Allali 2011). In order to increase the former limited supply capacity, a financial support mechanism, the Solar Industry Accompaniment, was created to help entrepreneurs with investment projects in the local manufacturing of SWHs. A technical assistance component was added to improve the company's manufacturing processes and, thus, increase product quality (Allali 2011, 6). Although the construction of SWHs is far from being as knowledge-intensive as the production of PV panels or CSP components, PROMASOL showed how targeted policies could create the necessary incentives for local companies to enter an emerging market.

All these strategic and institutional efforts have turned Morocco into the most attractive investment destination for RE projects in the MENA region. By 2012, a total of US$ 1,898 million has been committed from public and private investment sources (see Table 7). To capitalise on this positive investment trend, enhancing competitiveness in the emerging solar energy sector is crucial.

Table 7: New investment in renewable energy, by country, 2009–2012 (million US$)

	2009	2010	2011	2012
Algeria	-	-	33	-
Egypt	-	923	-	-
Iran	-	-	-	136
Iraq	103	-	-	-
Libya	-	132	-	-
Saudi Arabia	-	15	47	22
UAE	52	20	843	-
Israel	263	355	830	814
Morocco	-	8	309	1,898
Tunisia	57	-	-	-

Source: REN21 (2013)

Yet, further developing the solar energy sector to achieve inclusive competitiveness of the local industry is not a trivial undertaking. It requires actions at multiple levels and is influenced by both internal and external factors. Table 8 shows an assessment of these challenges and opportunities through the lens of a SWOT (strengths, weaknesses, opportunities and threats) analysis.

Table 8: SWOT analysis for Morocco's solar energy sector development		
	POSITIVE	**NEGATIVE**
INTERNAL FACTORS	**Strengths**	**Weaknesses**
	– High availability of wind and solar energy resources; – High commitment: national solar energy target of 2 GW by 2020; – Legal framework to enable large-scale projects; – National agencies dedicated to implementing the renewable energy targets (i.e. MASEN, ADEREE, ONEE, SIE); – First projects have been commissioned (i.e. Ouarzazate); – Reference projects such as Ain Beni Mathar and PERG; – Existing national investment funds offer a window for entrepreneurial activities; – Financial assistance from international donors available for first projects; – Establishment of IRESEN to stimulate knowledge development and R&D;	– A comprehensive national strategy for industrial and technology development is lacking; – The market for small and medium solar projects is not yet enabled; – Lack of FIT for solar energy; – Unpredictable market growth beyond the 2 GW target of solar energy; – Lack of start-up finance; – Lack of technical standards and quality control; – Limited R&D funding to support technology development; – Limited cooperation between academia, private sector and policy-makers; – Limited dissemination of information on renewables to the larger population; – Few RE experts and limited skilled workforce;

	POSITIVE	NEGATIVE
	– Preliminary studies to identify gaps in capabilities and knowledge; – Strong industry associations lobbying for private sector.	– Limited knowledge of renewables on the part of investors and banks; – Social and political challenges of reforming fossil fuel subsidies or redirect energy subsidies to renewable; – Limited engagement of civil society in the policy-making process.
EXTERNAL FACTORS	**Opportunities**	**Threats**
	– Proximity to Europe and existing electricity interconnection with Spain, opening up opportunities for clean energy exports to Europe; – Signed MoU with Dii for enabling EU-MENA energy market integration; – Cooperation with UfM in developing the MSP; – Various cooperation agreements with international partners for knowledge transfer and investment (i.e. Germany, France, Spain);	– Limited political support for EU-MENA energy market integration due mainly to European financial crisis likely to delay energy exports to Europe; – Limited market entry points for manufacturing due to global competition, especially from China; – Technological complexity of CSP components reduces opportunities for localisation and increases dependency on technology imports;

	POSITIVE	NEGATIVE
	– Interest from international donors to invest in large-scale CSP in Morocco for technology cost-reduction purposes (e.g. World Bank); – Steadily growing international role in combating climate change; – Strong government involvement and ownership with respect to RE developments in Morocco and in relation to international players; – Increasing pressure to demonstrate results nationally and internationally.	– Continuing political uncertainty in the Arab world; – No comprehensive institutional framework able to capture external climate change finance and investment for RE in Morocco.
Source: Based on Vidican (2012b) and Grant (2011)		

4 Mapping capabilities in the solar energy sector

Given the early stage of solar energy sector development in Morocco, existing capabilities within the private sector are relatively limited. Most companies active in the sector are involved in activities related to distribution and installation of imported parts and components for solar technologies. The local value added from these operations is, therefore, limited. Only a few companies operate as manufacturers, and even fewer are active in project development and engineering. In addition, as of now, two start-ups have surfaced in the sector. Table 9 illustrates various companies we interviewed grouped based on their activities and technologies that they are using.

Table 9: List of interviewed companies by type of activity

	Company name	Technology
Distributor / Installer	AE Photonics	SWP
	Batitherm	SWH
	Casatherm	SWH
	Energypoles*	SWH
	Hydrocentrale	SWH
	Istek Sun Power	SWH
	Medifer Impianti Maroc	PV, Wind
	Phototherme**	SWH, PV, CSP
	Regran Maroc	SWH, PV, CSP, Wind
	SERA	SWH, SWP, PV
	SOLEO	SWH, SWP
	SUN WAY Technology	SWH, SWP, PV
	TEKNA energy	PV, Wind
	Tramont International Maroc	SWP, PV
	Veli	SWH
Manufacturer	Alstom**	PV, CSP
	Cegelec**	PV, CSP
	Cleanergy*	PV
	DLM**	CSP, Wind
	Energypoles	SWH
	Schneider Electric	PV
	Valtronic**	PV, CSP

Project Developer and Engineering	CME Cegelec** DPI Jet Energy International Nareva Holding	PV, Wind PV, CSP PV PV Wind
Start-up	ERDK Alto Solution	SWH Solar Desalination
Note: *Production not yet started. **Potential production in CSP. Source: Interviews conducted between February and April 2013 in Morocco		

The solar energy technologies that are the focus of our study – CSP, PV, SWHs and SWPs (see Box 6 for the technical characteristics of these technologies) – all have different assets and drawbacks with regards to their contributions towards achieving inclusive competitiveness. Considering employment, the PV, SWH and SWP technologies provide more opportunities for lower-skilled labour (e.g. installation and maintenance). In this sense, it is assumed that these three technologies contribute more towards achieving inclusive competitiveness than CSP. These technologies are also advantageous because of lower investment requirements and lower construction and maintenance costs. Hence, PV, SWH and SWP technologies have an inclusive dimension, creating employment opportunities in different sectors and possibilities for building an industry around different components.

By contrast, the initial investment requirements for CSP are very high, as is the cost per kWh. There are fewer local employment opportunities, as only a few of the components for a CSP plant can be produced locally. Aside from labour for civil works, a CSP plant requires a specialised workforce that has experience with the complex technology. However, it does present promising opportunities for technology development and innovation (e.g. desalination for water-scarce regions) in the future. The innovation potential could also generate knowledge spillovers in the R&D sector. Furthermore, as part of the CSP technology, there is the possibility to develop lower-cost energy storage systems that make electricity production more viable and efficient at times when solar irradiation is low.

As a result, another positive factor for CSP is its suitability for exporting the produced electricity. CSP has thus a significant competitiveness potential, and the market for this new technology is slowly evolving. Yet, CSP does not have such an inclusive character in the short and medium term as do PV, SWHs and SWPs, but it may generate social and economic co-benefits from market growth when taking a long-term perspective.

Box 6: Technical characteristics of different solar energy technologies and applications

Concentrated solar power (CSP) plants produce electricity by converting concentrated direct solar irradiation into energy. Unlike photovoltaic cells or flat-plate solar thermal collectors, CSP power plants cannot use the diffuse solar irradiation caused by clouds and particles scattering direct sunlight because they cannot be concentrated. The energy conversion process has two parts: solar energy is first concentrated and converted into usable thermal energy, and then a conventional steam turbine converts that heat into electricity.

There are two main types of concentrating solar collectors (World Bank 2010): line-focusing systems (parabolic trough collectors and linear Fresnel collectors) and point-focusing systems (solar towers and solar dishes). The most advanced kind of CSP technology – the parabolic trough collector – consists of a receiver, mirrors, a metal support structure, pylons and foundations. Parabolic-shaped and faceted mirrors – which are coated with a layer of reflective silver – concentrate sunlight into the absorber tube, which is coated with an anti-reflective layer to readily transmit sunlight and is surrounded by an evacuated glass tube. The absorber tube and the encasing glass tube make up the "receiver". The curved mirrors and the receiver are the most technology-intensive components. Innovations in parabolic trough collectors focus on reducing costs in the assembly and production processes, creating lighter collector structures made of new materials and using new heat-transfer fluids (e.g. molten salt and direct stream).

One main advantage of CSP plants over other renewable-power technologies is the option of using molten salt, oil, sand or concrete to store energy. Another advantage of CSP technology is its application for seawater desalination, which is critical for the MENA countries, which face growing problems of water scarcity. The CSP market is highly concentrated, with a few companies located in Europe (Germany and Spain), the United States and, increasingly, in Asia. Greater deployment is expected to lead to cost reductions and higher technological improvements (World Bank 2011).

Solar photovoltaic (PV) is a simpler and more mature technology. Its main advantages – compared to CSP – are that it requires no direct sunlight, it has no moving parts and, thus, requires less maintenance. PV modules can further function as island operations on rooftops (remote power supply or solar home systems) or as large plants.

PV technologies can convert solar irradiation directly into an electric current within the module. All PV modules contain several layers, from a protection layer, through a transparent electric front contact to the absorption material, where the light is absorbed and converted into electricity. All these materials are semiconductors, mostly made of crystalline silicon (c-Si). At the back of the module is a metal contact that completes the electric circuitry and a laminate film to ensure waterproofing. Finally, the module is equipped with connectors and cables, with which it is wired. It then requires an inverter or transformer – depending on if it is connected to the grid or an island operation. Among the current PV modules, crystalline PV, concentrated PV and thin-film PV are the most common (Fraunhofer ISE 2012).

Worldwide, PV installations are growing and now represent the third largest RE source after hydro and wind power in terms of installed capacity. The leading market for PV manufacturing is currently China, where most of the modules are assembled. The global leader in PV applications is, however, Europe, with about 75 per cent of all new capacity installed in 2011 (EPIA 2012, 5), followed by China and the United States.

Solar water heaters (SWHs) produce heat by converting solar irradiation through the water flow in a black absorber pipe that warms up. The surface is covered by glass for reducing heat loss. SWHs can be used for warm water production, space heating and air conditioning. SWHs can be of interest to either large consumers, such as hotels and hospitals, or private consumers. Currently, China, Europe, Japan and Brazil dominate the SWH market (REN21 2011).

There are two types of solar water heating systems: (1) active heating systems, which have circulating pumps and controls, and (2) passive heating systems. Active solar water heating systems can have direct and indirect circulation systems. In the direct system, the heated water directly circulates through the collectors into the home. In indirect circulation systems, a heat-transfer fluid is pumped through the collectors and a heat exchanger. Passive solar water heating systems are oftentimes less expensive than active systems. In passive solar water heating systems, one distinguishes between integral collector-storage passive systems, where water heats up naturally in a tank, and thermosyphon systems, where the collector and the tank are separated and water flows through the home's water pipe system only when warm water rises from the collector to the storage tank (US Department of Energy 2013).

Solar water pumps (SWPs) are applications used with solar PV technology and are highly beneficial for the agricultural sector, especially in developing countries. The operation of solar-powered pumps is more economical and has less environmental impact than pumps powered by an internal combustion engine. A SWP has four parts: the pump, the controller, an electric motor and solar PV panels (Roy 2012).

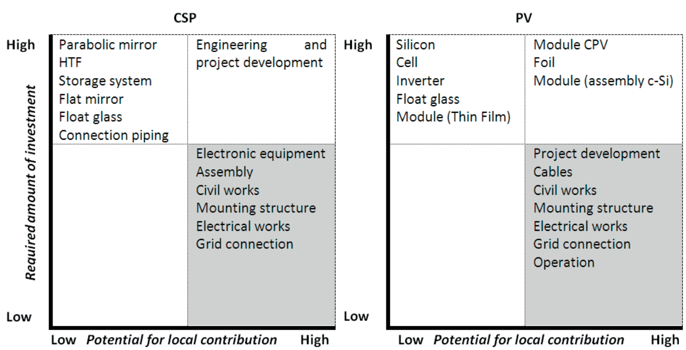
4.1 Existing capabilities within the value chain and potential employment effects

As several reports show (Dii 2013b; Fraunhofer ISE 2012; IRESEN 2013), there is variation in the potential contribution of Moroccan companies to the different phases of the value chain for CSP and PV power plants. As voiced by our interviewees, it is crucial for Moroccan companies to choose carefully what niche and what technology they work on. In the short- or medium term, Morocco will not have the capabilities to produce along the entire value chain, but it can concentrate on its existing capabilities and expand from there. Strategic policy interventions (e.g. SME upgrading programmes, education, training and R&D investments) can support local entrepreneurs in their efforts to strengthen their competitive and comparative advantages.

The value chains for the two electricity-generating technologies – PV and CSP – consist of seven phases, which include project development; materials; components; plant engineering and construction; operation; distribution and transmission of electricity; and finally dismantling of the plant.

Even though solar energy is a labour-intensive industry and can create jobs in Morocco, different technologies produce different numbers of jobs. The majority of the jobs for PV and CSP power plants are expected to be generated during the construction of the plant – predominantly the civil works and the assembly of components, mounting structures, metal structures and electrical works – during which the required amount of investment is low (see grey boxes in Figure 6). Aside from the technologically less-demanding civil works, capabilities in the electronics realm also exist. Electronics companies, such as Valtronics, Alstom and ADETEL, as well as cable manufacturer Leoni (active in the automotive sector) (foreign-invested firms that are producing in Morocco) are already producing parts and components that are relevant (and can be in the future) for the solar energy sector and that could be adapted to new solar technologies.

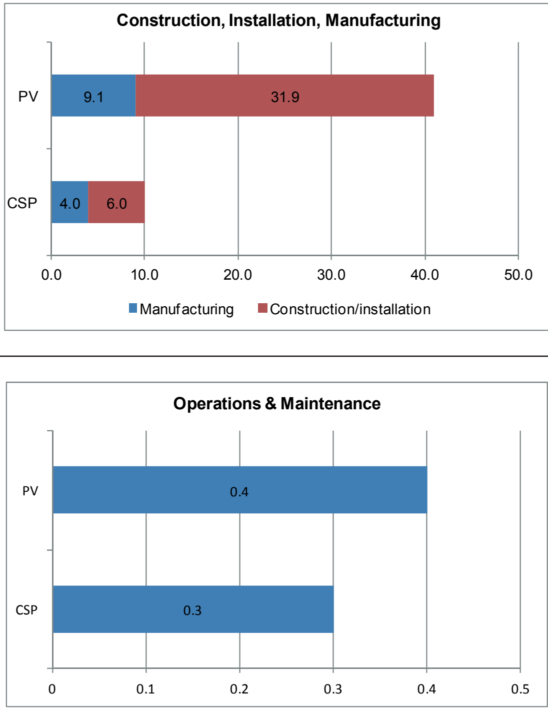
Figure 6: Local capabilities for manufacturing and operation of PV and CSP power plants



Source: Adapted from Fraunhofer ISE (2012)

Even though the employment effects for CSP, PV and SWHs are subject to an ongoing debate, we argue that if the market conditions are favourable (see Chapter 6), PV, SWHs and SWPs have a larger potential to localise employment than CSP (for PV and CSP see Figure 7). However, for both types of plants, the majority of the materials and components are sourced from different international suppliers – depending on price and quality.

Figure 7: PV generates more jobs per MW than CSP (FTE-year)

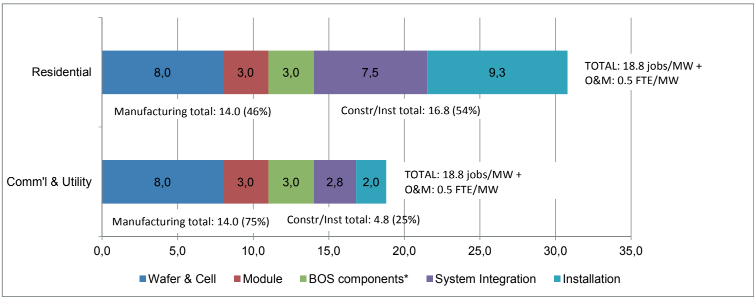


Source: Stone & Associates (2011, 81) based on Rutovitz (2009)

A recent report from Dii (2013a) based on extensive modelling of cross-Mediterranean energy market integration calculates that a 1 billion EUR investment in building CSP power plants is likely to generate between 29,000 and 35,000 jobs in Morocco. The same level of investment in large-scale PV power plants is likely to generate between 15,000 and 23,000 jobs in Morocco (Dii 2013a). Although the source of these jobs is not clearly explained, it is easier to see for PV where in the value chain these jobs could be created, as compared to CSP. A large market and enhanced technological capabilities are critical for these job effects to materialise.

As shown in Figure 8, PV generates more employment for residential use as compared to large commercial and utility-level power plants. This happens because the integration into the electrical system of the house as well as the construction and installation are more modular, costlier and require more manual work time. The latter also applies to SWHs and SWPs. Furthermore, as per our interviews, the three technologies have simpler electrical components and, together with the water tanks and water pumps, they can thus be partly produced and assembled in Morocco, even though the share of imported complete units is still high.

Figure 8: PV jobs per MW by value chain component (FTE-Year)



*BOS = Balance of systems; FTE = Full-time equivalent

Source: Stone & Associates (2011, 80) based on Navigant Consulting (2008)

Therefore, large potential exists for Morocco to expand its market for rooftop PV as well as for SWHs and SWPs. When looking at the installed capacity of SWHs in the whole MENA region (see Table 10), Morocco is below average and is not exploiting its full potential. By 2020, however, Morocco is aiming to deploy 1.7 million m^2 of SWHs, rolled out by ADEREE, in partnership with various local stakeholders. Chapter 6 will explore in more detail how policy instruments can be geared towards creating a demand for these technologies and applications.

Table 10: Installed capacity of SWHs in the MENA region

Country	Year	Total capacity (MW_{th})	Total collector area (m^2)
Algeria	2012	0.21	300
Egypt	2012	525.0	750,000
Libya	2012	0.021	30
Syria	2010	420.0	600,000
Israel	n/a	2,917.8	4,168,245
Jordan	2012	350.0	500,000
Lebanon	2012	245.0	350,000
Malta	2011	35,952.0	51,360
Morocco	2012	245.0	350,000
Palestinian Territories	2012	1,120.0	1,600,000
Tunisia	2012	437.5	625,000

Source: REN21 (2013)

The macroeconomic relevance of the emerging solar sector in terms of creating jobs, enhancing capabilities, securing the energy demand and even exporting energy is one key element of achieving inclusive competitiveness. Exporting electricity may become more and more important for MENA countries. Trading electricity is therefore an enormous opportunity for Morocco, and the CSP plant in Ouarzazate is a first step in this direction.[11] Yet, as discussed in Box 7, the macroeconomic effects of large CSP plants in Ouarzazate remain uncertain. Expanding these benefits requires a long-term, targeted approach that identifies what potential spillover effects can be stimulated for activities where local capabilities are higher. Further, given that local manufacturing is important for economic development, the choice

11 For more detailed information on the possibilities of exporting electricity from Morocco to Europe, see Dii (2012) and PWMSP (2012a).

of the appropriate technology – aligned with domestic technological capabilities – is of the essence.

Box 7: Case study on local development opportunities in Ouarzazate

In Ouarzazate, at the foothills of the Sahara Desert in eastern Morocco, King Mohammed VI recently turned the first spadeful of earth for the largest CSP plant in the world. Ouarzazate is a so-called *ville enclavé*, that is, not equipped with a large industrial base that allows for broader regional development. The access across the Atlas Mountains, through poor road and flight connections, makes it difficult to transport larger goods from and to desert cities. The social situation is, therefore, also challenging. The main sectors, film production and tourism, are in decline and new job opportunities are urgently needed.

Within this context, it is expected that the construction of large-scale solar plants might stimulate local development. The channels through which value creation for the local community can be achieved are: jobs for the construction of the plant; improved infrastructure and hence a reinvigoration of the tourism sector; the creation of an industrial zone; and a new vocational and academic training centre for RE and energy efficiency, namely, Institutes for Renewable Energy and Energy Efficiency (IFMEREE). The latter is supposed to attract students from all over Morocco and create a dynamic for development in the sector and the region.

A newly constructed road might bring tourists more easily to Ouarzazate, and hence boost the languishing tourism industry. Until now, only the tourism sector has created real revenue. However, local development should rather be based on a combination of tourism and industrial development. According to the vision of the national tourism board, the construction of large-scale solar plants in the region can contribute towards promoting green tourism, which could be advanced through an integrated development strategy by 2020. Given that tourism has been at the core of the local economy, integrating sustainable practices, RE and energy efficiency in the tourism concept for the Ouarzazate region could contribute towards creating a unique market niche for green tourism in Morocco. Such a strategy would also align closely with local capabilities and skills.

The potential for industrial development is, on the other hand, lower. The main problem is the weak local industrial base, which is not prepared for the requirements of the emerging solar energy sector. As a university professor put it: *"Ouarzazate is only décor."* The commitment to 30 per cent local content offered by the investor ACWA Power has not yet led to local benefits: the few Moroccan construction companies that are involved are from Casablanca or from other industrial centres on the coast. To support further value creation for the local economy, policy-makers are aiming to create a small industrial zone envisaged to not only stimulate industrial development directly related to the plant, but also to enhance technological capabilities more broadly. According to the Regional Investment Centres (CRIs), there has been interest from the private sector to invest in the industrial zone. CRIs support investors coming to the region by assisting with the necessary authorisations and branch establishment. Through their programme Moukawalati, they also support the creation of local SMEs in all sectors (although almost no companies from the solar energy value chain have used this programme). However, the programme has been criticised by our interviewees as having limited visibility and highly bureaucratic procedures. Several interviewees from the public sector also mentioned the fact that the information flow from MASEN needs to be further improved, especially in terms of the latest developments with respect to ongoing and upcoming projects, as well as the existing support mechanisms for the local industry. However, companies active in the solar energy sector in Morocco have shown limited interest and enthusiasm for relocating to (or setting up operations in) the Ouarzazate region, in the eventuality of a local industrial zone being established, mainly due to the underdeveloped industrial base, as discussed above.

Another challenge for local development in Ouarzazate is how the construction of large-scale CSP plants affects the land rights of the local population. Even though several socio-economic impact studies have been conducted and the vast desert land seems uninhabited, the land is of great importance to local pastoralists – both culturally and economically (Rignall 2012). These local groups were neither informed nor consulted when local land representatives sold the land for a relatively low price (Rignall 2012). These aspects are important for the inclusiveness dimension of the solar energy sector development.

Even though the construction of large-scale solar plants in the Ouarzazate region has the potential to stimulate local development in the medium and long term, the realisation of this potential requires a much more strategic process in close consultation with local stakeholders. The expansion of the industrial base and the creation of IFMEREE will require additional investment and need to be closely aligned with developments in the solar sector. The secondary employment effects in the tourism industry can also be harnessed more efficiently with a coherent strategy that integrates sustainability practices and RE technologies in the various tourism-related services. This could indeed open up several opportunities for Morocco to tap into a niche market.

Source: Rignall (2012) and interviews conducted with various stakeholders in Ouarzazate and Casablanca, February – April 2013.

However, in light of the above discussion of domestic capabilities in the solar energy sector, a representative from a leading Moroccan research institute in the area of solar energy expressed his concerns regarding Morocco's aspiration to produce solar panels and other components for the solar energy sector locally.[12] By looking at the bigger picture, it would become clear that, in light of the global crisis in the PV market – induced by competition from Chinese companies – Morocco would find it difficult to become competitive in manufacturing PV components in the short- or medium term. If Moroccan companies aspire to produce components, they have to evaluate carefully what part of the value chain is more suitable to the capabilities currently in place in Morocco. Our interviewee further suggested that Moroccan companies should try to engage as project developers and refrain from large-scale investments in manufacturing. In this part of the value chain (engineering, procurement and construction as well as operations and maintenance), it is likely that Moroccan players can become more competitive *vis-à-vis* Chinese companies, giving them an opportunity to build on existing know-how. In the field of R&D, interviewees suggested that Morocco could develop capabilities in storage technologies, since this is a relatively new field and not yet dominated by other countries.

12 Interview conducted in Rabat on 25 March 2013.

4.2 Potential measures to enhance domestic capabilities

A strategic focus on developing specific niche markets and capabilities for different solar technologies and applications is necessary for achieving inclusive competitiveness. To enhance local capabilities, Table 11 provides a rough illustration of the key issues related to the strengths, weaknesses and main requirements for different types of companies (e.g. distributors and installers of systems, SMEs focused on manufacturing, TNCs with activities in this sector) active in the emerging solar energy sector in Morocco, as per our fieldwork. The next chapters will further elaborate on these aspects. Policy-makers should build on these recommendations and those from other, more detailed studies of these issues (such as those from Fraunhofer and the World Bank) and devise actionable measures to support the long-term development of a solar energy industry in Morocco.

Table 11: Strengths, weaknesses and requirements for different company types

	Distributors / Installers	SMEs	TNCs
Strengths	– A large number of companies – national and international – are already present.	– A small number of companies are active in the sector, having evolved from earlier programmes for deploying RE technologies (PERG, PROMASOL); – Higher levels of competitiveness in sectors that are complementary and auxiliary to solar energy (e.g. electronics, automotive), enabling some companies to diversify in solar-related technologies.	– Interest from TNCs to invest in this emerging sector in Morocco has already materialised, as several companies are already present. – Companies that are not directly active in the solar sector show interest in diversifying in these activities.

	Distributors / Installers	SMEs	TNCs
Weaknesses	– Minimal differentiation between products; – Small market and demand for products and hence low service quality; – High level of energy subsidies reducing demand for solar energy technologies; – Focus on importing parts and components, or complete systems from abroad, with limited interest in sourcing locally.	– Small market for solar energy technologies, constraining the ability of SMEs to invest and enter the solar energy value chain; – Limited programmes to support the upgrading of SMEs in this sector; – Limited export capabilities to other countries in the region and in Europe.	– Small and unpredictable market for solar energy, increasing the risk of investment for these companies.
Requirements	– Improving market predictability (and continuous development); – Removing and targeting energy subsidies; – Setting up quality standards for local products;	– Improving predictability (and continuous development); – Opening up access to low- and medium-voltage market for solar energy;	– Improving predictability (and continuous development); – Opening up access to low- and medium-voltage market for solar energy;

	Distributors / Installers	SMEs	TNCs
Require-ments	– Expanding industrial upgrading programmes to boost the quality of local products and services; – Education and training for technicians and installers; – Awareness campaigns for the benefits of RE.	– Expanding industrial upgrading programmes to boost the quality of local products and services; – Education and training programmes; – Fostering business linkages with TNCs.	– Fostering business linkages with local SMEs.

Source: Own illustration based on interviews with various stakeholders in Morocco between February and April 2013.

5 Enhancing technological capabilities

Technological capabilities that nurture knowledge-based assets[13] are crucial for achieving inclusive competitiveness, as local companies have to be able to learn, internalise and utilise management skills and technological knowledge offered by direct linkages with TNCs (UNCTAD 2010, 15, 20). Given the early stage of renewable energy development in Morocco (and the MENA region at large), reliance on acquiring knowledge-based assets through cooperation with leading firms is critical. Technology transfer is therefore necessary for acquiring capabilities in the emerging solar energy sector (to be discussed in more detail in Chapter 8). Technology, broadly defined, refers to principles, data and understanding that are potentially usable in a wide range of different applications; more concrete and specifically applicable designs and "blueprints"; concretised production facilities; methods and organisational arrangements; or very specific and concrete forms

13 As per Amsden (2001, 3) *"a knowledge-based asset is a set of skills that allow its owner to produce and distribute a product at above prevailing market prices (or below market costs)."*

of the product technology (Bell 2007, 22). Further, the knowledge needed to compete in world markets – critical for countries such as Morocco seeking to develop new sectors – comprises unique skills, *sui generis* capabilities, novel product concepts and idiosyncratic production systems (Amsden 2001).

In order to be able to develop such knowledge, different capabilities are needed. First, it is necessary to enhance capabilities for creating new knowledge, usually referred to as **knowledge and R&D capabilities**; well-trained and well-educated personnel and experts in the respective field are a prerequisite to be able to adopt, innovate and upgrade new technologies and procedures. These knowledge and R&D capabilities developed in public research institutions (universities and research institutes) have to be closely aligned with the needs of the private sector. Second, capabilities for transforming knowledge, such as design and engineering capabilities, and capabilities for using knowledge in the form of specific operational systems, such as operating or production capabilities, have to be acquired by a company through a process of **industrial upgrading**. Measures for creating and implementing production innovations and enhancing products, processes and organisational structures are crucial for local companies to become attractive partners to TNCs and benefit from subsequent spillover effects (Altenburg 2000, 35).

Strengthening technological capabilities is not only a task at the firm-level but is also determined by the overall environment, such as the availability of an educated workforce or the quality of universities or training and financial institutions (Altenburg 2005, 37). Below we discuss the different aspects of strengthening knowledge and R&D capabilities as well as measures for industrial upgrading with reference to existing programmes in Morocco. In addition, we propose policy recommendations for enhancing technological capabilities in the emerging solar energy sector in Morocco.

5.1 The relevance of knowledge and R&D capabilities for competitiveness

Competitiveness requires strong publicly funded research institutions[14] (such as universities and research institutes) that drive and sustain innovation. Universities have assumed a more active role in society by participating strongly in the process of economic development (Srinivas / Viljamaa 2002). Universities contribute to development through creating new knowledge, increasing the skills of the workforce and enhancing the entrepreneurial spirit, which ultimately enhances competitiveness (Vidican / Stamm 2013). Contrary to firms, universities have the advantage of being relatively permanent institutions, and therefore more interested in long-term development goals (Vidican / Stamm 2013). Specialised research institutes also play an important role through their contribution to applied science. Yet, to enhance knowledge and technological capabilities, close cooperation between public research institutions and the private sector is essential.

In our interviews with the private sector as well as with academia and research institutes, it became evident that the basic level of education and training in engineering fields is high in Morocco. Programmes are already in place to enhance vocational training for different types of RE-related skills. MEMEE has prepared an extensive report to assess competencies needed for the RE sector in Morocco. An important message from this study is that vocational training has to be further adapted to the needs of the private sector and to the evolving technologies. Based on this assessment, various programmes for enhancing technical and vocational skills have been proposed for implementation by the national vocational training agency Office de la Formation Professionelle et de la Promotion du Travail. Therefore, in our study we decided to focus on assessing only the research and higher education sector. In this sector, vast improvements are necessary, guided by a road map that aligns the higher education and research strategy with the larger national RE development strategy. Existing initiatives at the university and research institute level underline the strong interest to expand capabilities in solar energy but point to a lack of synergies between various efforts.

14 Publicly funded research institutions encompass all research institutions that are financed by the state to a considerable degree. Universities and research institutes tend to be part of this group. In this report we use the terms “publicly funded research institutions” and “public research institutions” interchangeably.

Interviews with professionals in the private sector revealed that graduates from universities are lacking practical knowledge (in the field of RE and more generally), advanced technical skills[15] as well as R&D capabilities developed in close cooperation with the private sector. In addition, as a broad set of skills are needed to enhance value creation in the RE sector, non-engineering skills (e.g. economics, business management, entrepreneurship, law) should also be widely enhanced. As a high number of young Moroccans are studying abroad, especially in Western Europe, and acquiring advanced degrees in various fields, opportunities should be created for "reverse brain drain" (or reverse migration) to support recent developments in Morocco.

Below we provide a brief overview of current developments and challenges in the field of knowledge creation (at universities and research institutes) in Morocco and reflect on opportunities to foster close cooperation with the private sector.

5.1.1 Activities at universities and research institutes

RE technologies represent a relatively new field of knowledge for **universities** in Morocco. Basic research on RE technologies (especially solar energy) started in the 1980s. However, due to lack of funding and limited interests in this field before 2009, research and education programmes remained scattered. Further, a clear strategy has been lacking with respect to the role universities should play in supporting the development of the solar energy sector and the most optimal way of integrating RE into the curriculum.

Among the 15 public universities, several have already developed solar energy curricula and research activities, embedded mainly in electrical engineering programmes, while others are considering creating specific programmes focused on solar or wind energy. As per our interviewees in

15 Given that many young Moroccans choose to pursue university studies abroad, they become the recruitment targets of lead companies based in Morocco. To exemplify this point, one large Moroccan company of French origin claimed that half of their skilled employees are Moroccans who have acquired advanced technical knowledge in France but want to return to Morocco and work in "a French-minded company". Hence, each year the company participates in two recruitment fairs in France. Moroccan *"high-ranked engineers that will be the elite of tomorrow for middle management is very hard* [to find in Morocco]" (interview conducted with a large Moroccan company in Casablanca on 20 February 2013).

the academic sphere, the most prominent universities in this field are: Université Cadi Ayyad Marrakech (Faculté de Sciences Semlalia); Université Abdelmakel Essaadi Tanger-Tétouan (Faculté des Sciences de Tétouan); Université Mohammed V Agdal Rabat (Faculté des Sciences de Rabat and Ecole Mohammadia d'Ingéneurs); Université Mohamed 1er Oujda (Faculté des Sciences d'Oujda); Université Hassan 1er Settat (Faculté des Sciences et Techniques de Settat); and Ecole Nationale de l'Industrie Minérale (ENIM). The International University of Rabat is also known to be among the best private universities. The main areas of research in solar energy at Moroccan universities are solar energy measurement, materials for solar cells, solar energy systems and solar energy applications (Barhdadi / Attoch 2012). However, in spite of these universities having added courses on RE (mostly solar energy) into the curricula, uncertainty persists regarding how to best integrate RE technologies in teaching modules and degree programmes.

Further, our interviews revealed that the challenge for most universities is how to allocate human and financial resources for these new programmes. For example, ENIM has been tasked by MEMEE to create a new master's programme on renewable energy; but with limited funding for hiring and/or re-training faculty, setting up the programme has been a difficult task.[16] As per our interviewee, normally, several years of preparation are needed when a new programme is being created. However, as MEMEE wanted to have new RE specialisations established in universities very quickly, only two or three professors came from Morocco, whereas most were brought in on a temporary basis from abroad (e.g. Germany and Spain). As no professor at ENIM is specialised in CSP, the preparation process has been slow, as they need time to gather materials and to learn about the new technologies.[17] As part of this preparation process, ENIM took part in a seminar programme organised by the German Aerospace Center (DLR), enerMENA (see Box 8), with assistance from GIZ, which was aimed at training faculty on RE and energy efficiency technologies and at assisting universities with developing curricula in this field. The experience with this programme, aimed at transferring knowledge and building local capabilities, has been very positive.

16 Interview with ENIM in Rabat on 22 February 2013.

17 *"It takes time to absorb the knowledge. It takes time to start preparing an own course, to develop a well-organised course. It takes a little bit of time. Moreover, professors are involved in other courses, too. They teach in other courses. Normally the administration should have hired two or three professors to teach in these new courses. There are already a lot of courses to teach"* (interview with ENIM in Rabat on 22 February 2013).

Box 8: enerMENA – A programme for the implementation of solar-thermal-power-plant technology in North Africa

The enerMENA programme, funded by the German Foreign Ministry, was initiated and is run by the Institute of Solar Research at DLR, which was a pioneer in shaping the Desertec concept. The project aims to develop CSP-related training materials, and addresses institutions and key persons from R&D, educational institutions and the public and private sectors who are active in CSP technology development in the MENA region. The project has three targets: the analysis and optimisation of CSP plants, the dissemination of CSP technology and the multiplication of local know-how.

Analysis and optimisation of CSP plants

In addition to enerMENA, DLR also conducts on-site measurements during the construction of solar thermal power plants in North Africa to train local personnel to evaluate the quality of manufactured collectors, and also to provide valuable data to improve the quality of the collector field.

Dissemination of CSP technology

In order to support the development of a market for CSP technology in North Africa in general, and also to initiate or foster local industry participation in this technology, enerMENA will encourage local institutions – backed by DLR experts, who will provide training and qualification – to serve as contact points for project development. A network of eight meteorological stations will also be established in North Africa.

Multiplication of know-how

The enerMENA project offers educational material on CSP technology to universities, training centres and high schools in the local language. Professors and teachers take part in workshops held to analyse the material and adapt it to their needs.

Partners in the MENA region include: MASEN; ONEE (Morocco); Ecopark Borj-Cedria (Tunisia); CRTEn Technopole de Borj Cedria (Tunisia); the National Energy Research Centre (Jordan); the Energy

Centre at the University of Jordan; the University of Jordan; NEAL–New Energy (Algeria); and Cairo University (Egypt).

Source: Vidican (2012a) based on DLR (2013)

In addition to limited internal resources to dedicate towards creating new programmes for RE, the lack of equipment for testing and experimentation has been an important challenge for universities to become more active in this field. For example, a solar energy consultant has told us that when researchers apply to the Ministry of National Education, Higher Education, Training and Scientific Research (hereafter Ministry of Education) for equipment, they sometimes have to wait two or three years in order to get a positive response. Interviews with universities have also revealed that funding for equipment from national sources (such as the Ministry of Education) is limited or non-existent. As a result, universities depend on donations of equipment from the private sector, which allows them to use it for experimental and teaching purposes, but it is not sufficient for exploring deeper into their RE activities. Currently, most research is conducted in collaboration with peers from abroad (especially France) (Barhdadi / Attoch 2012), which is critical for getting access to equipment.

At the same time, when developments in the private sector are weak (i.e. when the market for RE is limited), the demand for advanced skills in the RE field tends to be low. Therefore, as pointed in our interview with ENIM, engineering graduates who are part of the RE programme face difficulties in finding jobs in this field. Further, with reference to the Master programme at ENIM, the fact that RE education programmes are currently very general (focusing on all technologies and not delving deep enough into one specific technology) contributes to this problem.[18]

Yet, although basic engineering knowledge is widely available in Morocco, strong education programmes in social sciences (such as energy policy and economics, environmental law, management, marketing and entrepreneurship) – critical for supporting the transition to low-carbon development – are currently weak and not targeted towards addressing the specific concerns of RE technologies.

18 Interview with ENIM in Rabat on 22 February 2013.

A good-practice example of a promising university with a focus on RE in the MENA region is the Masdar Institute for Science and Technology in Abu Dhabi, United Arab Emirates (UAE) (see Box 9). The Masdar Institute is a new graduate-level research university set up in cooperation with the Massachusetts Institute of Technology (MIT) in the United States. The university focuses on a systemic approach to knowledge creation in the field of clean energy, with curricula that integrate technology, policy and systems analysis. Given the lack of domestic expertise in renewable energy technologies, the UAE government decided to create an entirely new university to provide high-quality education and develop cutting-edge technologies of relevance for the energy transition in the region. While the specific conditions are different between Morocco and the UAE, similarities do exist when it comes to high-level government commitment for an integrated development of the solar energy sector. The focus of the Masdar Institute on advancing research and developing a new model of education, its strong links with the private sector and with other academic institutions abroad, and its alignment to the national industrial development strategy are relevant to Moroccan policy-makers. At the same time, the integration of theoretical and practical knowledge relating to renewable energy into traditional engineering disciplines – and its growing emphasis on non-engineering fields – could provide a good-practice example for how to integrate RE in the higher education system in Morocco. Development cooperation institutions could potentially support laboratory equipment with financing and foster long-term collaborations with strategic academic institutions to maximise transfer of know-how.

Box 9: The Masdar Institute for Science and Technology in Abu Dhabi

The Masdar Institute is a graduate-level research university that was established in 2008 in collaboration with MIT. MIT is assisting the Masdar Institute with setting up the curriculum, fostering research collaborations and supporting knowledge transfer.

Bearing in mind the potential role that universities can play in supporting the establishment of new industries, it is important to mention that the Masdar Institute is currently the only academic establishment that focuses its entire curriculum on advanced energy and sustainability (Vidican et al. 2012). The education and research activities at the Masdar Institute are integrating three key elements: technology, policy and systems.

The university was created as part of the Masdar Initiative, a landmark project of the UAE government aimed at positioning the country on a pathway towards sustainable growth. The Emirate of Abu Dhabi, which hosts one of the largest oil reserves, has been driving this process. With a budget of US$ 16 billion, the Masdar Initiative aims to not only develop the necessary know-how for clean and renewable energy developments, but to also transform the UAE into a renewable energy hub for the MENA region. The development of Masdar City (a carbon-neutral residential/work community and industrial and R&D cluster), the development of pilot projects for solar energy and the creation of an investment unit for emerging technologies at regional and international levels are some of its main activities. As of now the UAE has generated 125.5 MW installed capacity of solar energy since 2008 (REN21 2013).

The Masdar Institute offers master's programmes in seven traditional engineering fields (i.e. chemical engineering; computing and information science; electrical power engineering; materials science and engineering; mechanical engineering; microsystems engineering; water and environmental engineering) and one inter-disciplinary field – engineering systems and management – which combines technical know-how with relevant social science disciplines (e.g. economics, environmental policy, management, entrepreneurship) (Masdar Institute 2013). The teaching and research activities within these programmes are entirely focused on clean energy technologies and their applications, combining theory with practice. Since 2011 the Masdar Institute has also offered an Interdisciplinary Doctoral Degree Program, which allows students the flexibility of crossing boundaries of more than one scientific or technical academic programme. The Institute also provides practicing professionals currently employed in local industries with the opportunity to earn a Master of Science degree while pursuing their professional ambitions (Masdar Institute 2013). Lastly, the Institute is also highly involved in outreach activities at local schools and also within the MENA region, for increasing awareness about renewable energy and sustainable development and contributing towards building knowledge capabilities (Masdar Institute 2013). Faculty at the Masdar Institute have a balanced load between teaching and research, with an emphasis placed on advancing research and cooperation with research institutions abroad and with the private sector.

Due to the strong commitment of the UAE government to this initiative, a high level of investment has been made in setting up state-of-the-art research laboratories. This allows faculty to focus on basic research and to develop solutions for adapting existing technologies to local environmental conditions (e.g. water desalination, advanced materials for solar technologies that can withstand high heat and dust, solar cooling systems, biofuels from algae) (Masdar Institute 2013).

To support technology commercialisation and the creation of start-ups, the Institute is also launching the UAE's first Innovation and Entrepreneurship Center, bringing together scientists, officials, investors and private sector representatives (Masdar Institute 2013). The Center will focus on transmitting ideas from the lab to industry by way of mentorship; graduate and executive education programmes in technical management, entrepreneurship and innovation; and access to investors geared towards incubating start-up companies.

The collaboration with MIT, which has extensive experience in international collaborations, has been critical for the Masdar Institute, which developed in an environment where higher education institutions focus on theoretical rather than practical knowledge, and where the research tradition is very limited, with only rare collaborations between academia and the private sector. The transfer of know-how from MIT to the Masdar Institute has been essential in this process, from administrative procedures aimed at holding high standards in recruitment (of both faculty and students), to setting up the management structure for the Institute and developing its strategy and road map for achieving its goals, as well as adapting the US education system to the local environment.

The interest of Moroccan universities in the emerging RE sector has been made visible through various networking forums that have emerged in the past couple of years, such as the networking group Master National en Energie Renouvelable et en Efficacité Energétique (MANEREE).There are other, more recent networking platforms, such as the Renewable Energy University Network (REUNET) and Moroccan Society of Renewable Energy

Development (SMADER).[19] SMADER was created in 2006 when RE was not a priority, but researchers in the field wanted to be part of an institutional structure, an association that is representative of their interests. However, the association has not been working well since its establishment and currently there are efforts to revive it.[20] As mentioned by Centre National pour la Recherche Scientifique et Technique (CNRST), SMADER has organised various workshops on RE topics (e.g. a workshop on hydrogen in 2009) before the publication of Plan Solaire. But, at that time, the association made only timid efforts to consolidate activities in this area. As opposed to being an association, which is what SMADER is aiming for, MANEREE's main objective is to offer a platform of networking and communication between academics with expertise and interest in this field, and to ultimately establish a master's programme for RE. According to MANEREE, 14 different universities are currently offering 31 education and training programmes entirely or partially dedicated to RE and energy efficiency. The active interest of the academic sector in this emerging sector is also reflected by the fact that several universities are organising student-led seminars on RE in cooperation with the private sector (for example ENIM, Al Akhawayn University, Moulay Slimane University). Universities are also increasingly present at national and regional conferences on solar energy. To increase synergies between the various university-level activities and initiatives, in March 2013 MANEREE and SMADER organised a joint conference, in preparation for which an inventory of the teaching and research competences was created. REUNET has also been involved with the University of Ouarzazate and the Draa Association in the Ouarzazate region to identify solutions for local economic development, such as electrification, and address problems related to desertification.[21]

However, without clear guidance on which technology areas are relevant for the long tem (due to the lack of a technology strategy at the national level), and more importantly, without sufficient funding to expand programmes and activities in this field, universities find it difficult to play a more active role in the emerging RE sector in Morocco. The Ministry of Education has various programmes to support research in the RE sector, but funding appears to be limited, and information regarding funding sources is not always transparent.

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19 REUNET has not yet been established as a formal institution, and our interviews revealed a certain level of scepticism with respect to its legitimacy. SMADER is a relatively new forum, but it appears to be gaining momentum in the academic community.

20 Interview with CNRST in Rabat on 25 February 2013.

21 Joint meeting with a group of faculty from University of Ouarzazate on 7 March 2013.

At the same time, there seem to be limited sources for other types of funding, for example from the private sector. In addition, administrative hurdles exist. For instance, the government procurement process for new equipment tends to be lengthy and cumbersome, as discussed above.

As a result, Morocco's performance, with respect to innovation and R&D, has been weak, as regional and global rankings such as the *Global Competitiveness Report* (WEF 2013a) and the *Global Innovation Index* (INSEAD / World Intellectual Property Organization 2012) reflect. The lack of strong **research institutes** enhances this problem, posing challenges to achieving competitiveness in the emerging solar energy sector. As one of our interviewees mentioned, a key concern for building technological capabilities in Morocco is that *"there is a culture of rather trade than innovation, there is a lack of research and development and a lack of entrepreneurial spirit, both in research* [institutions] *and in enterprises, there is a lack of cooperation and teamwork between different actors."*[22] Although these deficiencies are typical of developing countries, they do point to structural problems and the need for a long-term systematic approach to develop a culture of entrepreneurship and innovation.

More recently, however, important steps have been taken in this direction by creating the Institut de Recherche en Energie Solaire et Energies Nouvelles (IRESEN) and the Moroccan Foundation for Advanced Sciences, Innovation and Research (MAScIR), working alongside more established research institutes such as CNRST and Académie Hassan II des Sciences et Techniques. Historically, CNRST was the first institution to do research on RE technologies in Morocco, but its budget has been substantially reduced and no guidelines for strict application-oriented research exist. CNRST can support other universities with their funding, but is not allowed to attribute it to its own units.[23] Also, the Académie Hassan II promotes and develops scientific and technical research, and evaluates and funds research projects and programmes in Morocco. The Academy has been in operation since October 1993.

IRESEN, created in 2011, supports projects in the solar energy sector to be carried out in partnership between universities and private firms. Among its founding partners are ADEREE; the National Center for Energy, Science

22 Interview with a research institute in Rabat on 25 March 2013.

23 Interview with CNRST in Rabat on 25 February 2013.

and Nuclear Technology; MASEN; the Office Chérifien des Phosphates (OCP), the largest Moroccan private company; ONEE; the National Office of Hydrocarbons and Mines; and SIE. IRESEN aims at promoting R&D in the solar energy sector, pushing applied research and addressing the missing link between academia and the private sector. For example, one line of work for IRESEN is to identify how to apply CSP technologies for smaller-scale applications such as co-generation and green cities (by developing small-scale pilot projects), so that the local industry can engage with this technology.[24] The institute also aims to finance and manage its own R&D projects. Nonetheless, some interviewees pointed out the need for closer coordination between IRESEN and other stakeholders (e.g. MASEN and the Ministry of Education).

Although IRESEN's focus on applied research is clear (and hence its focus on mid- to large-size companies), concern has been expressed with respect to a lack of funding for start-ups and SMEs. The World Bank proposal to create a Clean Innovation Centre in Morocco might fill this gap. Clean Innovation Centres are currently proposed for countries as diverse as Kenya, India, Vietnam, the Caribbean, South Africa and Ethiopia. They aim at fostering the countries' engagement in green growth and for creating green jobs in new sectors and technologies. These centres would offer financing for local firms in the early stages to facilitate development in a sustainable and innovative way while responding to local needs. Other services will also be offered, such as making funding information available, providing consulting services and creating a technological network in Morocco.[25] Alternative short-term funding exists, either through competition prizes, such as the Grand Prix for Innovation and Scientific Research; the Golden Medal for Sciences and Technology; the prize for university-company partnerships; or through sources such as the Hassan II Fund or the National Fund for Science and Technology. A government programme sponsored by the Centre Marocain de l'Innovation (CMI), named Intilak, supports enterprises younger than two years (start-ups). Under the umbrella of this project, early-stage start-ups can have 90 per cent of their research-oriented expensed covered in the form of credit, up to 1 million MAD, which has to be paid back only if the project succeeds (Haimoud 2013). This programme has been used successfully in some cases, for instance by the energy start-up Essaid Raoui

24 Interview with IRESEN in Rabat on 25 March 2013.

25 Interview with the World Bank in Rabat on 15 February 2013.

Développement Kénitra (ERDK). Another financing instrument to support innovation and R&D activities at firms and in cooperation with research institutes, channelled through CMI, is Tatwir. Tatwir targets enterprises older than two years for R&D projects developed under a cluster framework, or for a consortium of enterprises and researchers. It finances 50 per cent of project expenses, up to 4 million MAD (Haimoud 2013).[26] Both of these financing mechanisms end in 2013.

MAScIR, a new but very promising research institute created in 2009 focusing on nanomaterials, nanotechnology, biotechnology and microelectronics, is following a shared funding approach to research, aiming to provide innovative solutions to market needs in the fields of environment, energy and health. One-third of the institute's funding is provided by the private sector, one-third by *"agences de moyen*" (such as IRESEN), and one-third by direct subsidies. Currently, MAScIR has approximately 110 researchers, mainly from Morocco, including doctoral students from Moroccan universities. The board of trustees of MAScIR is comprised of members from government (MEMEE, MCINET, Ministry of Economy and Finance), universities and research centres (Al Akhawayn University in Ifrane, CNRST, Académie Hassan II des Sciences et Techniques), as well as from the private sector, namely OCP, which is one of the main research funders.[27] MAScIR is oriented towards three types of projects: research contracts with the private sector, science-driven projects that are self-financed and partnerships with the private sector where funding is shared (each party covers its own expenses).

Research projects at MAScIR are directed towards developing the industry, improving innovation and facilitating technology transfer. MAScIR carries out 50 smaller and some bigger projects at a time. More recently, these projects have focused on solar energy as well (some based on research contracts with the private sector and some science-driven projects that are self-financed). Researchers of the institute either have a research contract

26 CMI has a third programme, Prestation Technologique Réseau, dedicated to projects aimed at supporting projects focused on innovation and technology development, carried out by individual enterprises or a consortium of enterprises, covering 75 per cent of expenses, up to 100,000 MAD (Haimoud 2013).

27 OCP, founded in 1920, is the largest Moroccan company. It is specialised in the extraction, transformation and sale of phosphate and its derivatives: phosphoric acid and fertilisers. OCP is the largest exporter of phosphate rock and phosphoric acid, and one of the world's largest fertiliser producers.

with the private sector or they work in partnership with a company for sharing findings and knowledge of independent research projects. Since it was established, four start-ups have been created and two patents have been filed out of MAScIR's research activities. Although it is still too early to assess its impact, MAScIR is certainly pursuing a novel model of research in Morocco, aimed at fostering innovation and technology transfer, along the lines of renowned research organisations such as the Fraunhofer Institutes in Germany and the National Renewable Energy Laboratory in the United States. Such research platforms should be further supported, offering opportunities to build a culture of research and collaboration between academia, research institutes and the private sector.

5.1.2 Fostering cooperation with the private sector

Historically, there has been limited cooperation between public research institutions and the private sector in Morocco. As per our interviews, the main challenges to stronger cooperation between these actors in Morocco are three-fold: (1) in the education and research sector, there is a preference towards teaching and basic research; (2) in the private sector, there is a *"culture of trade rather than innovation"*, as well as a lack of R&D and entrepreneurial spirit; (3) both at the research and enterprise levels, *"there is a strong lack of cooperation and teamwork between different actors."*[28] Steps to overcome these challenges are starting to become more visible. Therefore, strategic efforts are needed to bring these actors closer together. Closer cooperation could materialise by: strengthening the activities of stakeholders such as IRESEN; developing structures of industry collaboration in universities (e.g. incubation centres, industrial liaison programmes); fostering communication platforms geared towards achieving win-win outcomes for these actors; including private sector experience as a requirement in faculty assessments (e.g. third-party funding, research cooperation, entrepreneurial experience); and developing pilot projects that demonstrate the benefits from joint funding and cooperation.

With respect to **cooperation between universities and the private sector**, some interviews with professionals in the private sector pointed to a certain mismatch between the rather theoretical education given in universities and

28 Interview with a research institute in Rabat on 25 March 2013.

the practical, experience-based requirements at the firm-level. Others argued that Moroccan enterprises have limited capabilities to engage in R&D and innovation. Also, a temporal mismatch has been mentioned, as it takes time for universities to start preparing new courses on RE and to develop expertise in applied research, which is at odds with the immediate needs of the private sector. This temporal mismatch also materialises in differences with respect to planning horizons. Universities would need to plan two years in advance what programmes they need, as the approval process from the Ministry of Education takes a long time.[29] This means that companies would only get the trained students in approximately five years.[30] This period is too long for enterprises, as many things can change in the meanwhile in the realm of markets and technologies.

Currently, most cooperation between universities and the private sector materialises in identifying thesis topics for university students. At ENIM, for example, in the field of energy, large companies such as Cegelec (a large company that designs, installs and maintains systems for industry, infrastructure and the services sector, especially in high-demand sectors such as energy and electricity, oil and gas, building, civil engineering and maintenance), OCP, Managem (a large mining company), and more recently national-level agencies, such as MASEN and ONEE, work closely with faculty and students to identify suitable topics for theses.[31] Such companies have their own research departments, which facilitate cooperation with universities and stimulate interest in working with university students. ADETEL (a large company that designs, installs and manufactures electronics and software systems), for example, has developed a research collaboration on inverters with the private university Mundiapolis.[32] Student internships are also an effective channel for collaboration between universities and the private sector. However, interviews highlight that such internships are less frequent in the RE sector, which is also a reflection of the fact that the industrial sector and the market for RE is still emerging in Morocco.

In addition to technical education, interviews with professionals in the private sector revealed a lack of entrepreneurial knowledge and expertise. Such knowledge could be acquired through project-level cooperation with

29 Interview with an enterprise in Casablanca on 12 March 2013.

30 Interview with a large company in Casablanca on 12 March 2013.

31 Interview with EMIN in Rabat on 22 February 2013.

32 Interview with ADETEL in Mohammedia on 5 March 2013.

enterprises, which may benefit from innovative business ideas. Although strengthening management and entrepreneurship programmes at universities could help close that knowledge gap, there are only a few such programmes at universities in Morocco, and their effectiveness has not been proven yet. A good-practice example in the MENA region, which could be relevant to Morocco, is the Entrepreneurship and Innovation Program at the American University Cairo (AUC) (see Box 10), where a platform has been created for students to cooperate with technology-based firms and venture capitalists on developing new business ideas. In particular, the Venture Lab at AUC is a great example of how students can be exposed to entrepreneurial activities as part of their education on campus. This example is relevant, as it underscores the fact that courses on entrepreneurship are not enough; rather, practical interaction on real projects with relevant stakeholders (e.g. enterprises, financiers) is critical.

Box 10: American University Cairo in Egypt – Entrepreneurship and Innovation Program

The Entrepreneurship and Innovation Program was established at the Business School of AUC in order to *"create an environment that fosters the development of principled and innovative business leaders and entrepreneurs who can make a difference."* The programme aims at giving students the opportunity to receive a high-quality education with a special focus on new technologies such as solar technologies. The social science skills taught in this programme will motivate the students to feel more inclined to innovate and participate in the creation process of a new market.

In order to reach this aim of bringing together theoretical and practical skills, the students work in close cooperation with venture capitalists, angel investors and mentors. Furthermore, several conferences, workshops and seminars are organised in collaboration with members of the private sector and applied research.

In particular, the Flat6Labs is a programme that was created in cooperation with the Sawari Ventures to provide technology visionaries with the necessary resources to bring their vision into reality. Four times a year, Flat6Labs hosts teams for a three-month period and gives them access to the facilities, expertise, mentorship and support needed to make the most of their talent. The teams participating in this programme receive seed funding in the range of US$ 10,000 as they attempt to define their product, develop their core application, construct a well-balanced business plan and commercialise their enterprise. In exchange for a 10–15 per cent stake of equity in their companies, these entrepreneurs are given the chance to face the real-world challenges and obstacles of creating and maintaining a start-up in the local and global environment. To support the team, AUC has developed an Entrepreneurship Development Program, which consists of 10 sessions, taught by faculty and mentors with entrepreneurial expertise. These sessions must convey concepts of investment, marketing, finance, product design, legal procedures, networking and other aspects relevant to enhancing necessary skills for entrepreneurship.

At the end of the three-month period, Flat6Labs holds a Demo Day event, where the start-ups are given the opportunity to showcase their products to potential investors. If any one of them is successful in the bid to establish a fully furnished enterprise with promising market potential, it graduates from Flat6Labs and receives additional funding, in the range of $US 40,000.

Another important initiative that emerged from the Entrepreneurship and Innovation Program is the creation of an incubator for start-ups across Egypt: the Venture Lab (V-Lab) (Dalakian 2013). AUC's incubator will be initially fuelled by the start-ups that are competing in the Venture Lab Challenge aimed at selecting five to six start-ups for incubation. The V-Lab is sector-neutral and does not take equity in any of the start-ups; most of the applications received are technology-enabled start-ups, focused on building new mobile apps, renewable energy solutions and retail platforms. By drawing on good practices of business incubators and customising various options to the specific needs of Egypt, V-Lab is a unique initiative in the MENA region.

Source: AUC (2013)

At universities, research cooperation with the private sector is generally coordinated through administrative bodies such as the Industrial Liaison (or Affiliate) Offices (see Box 11). One of the main contributions that these offices make in fostering cooperation with the private sector is increasing transparency of research and education programmes within the universities, actively seeking potential areas of collaboration and managing the oftentimes complex system of commercialising technology out of university research labs. Such offices are quite common at universities in North America, but they are increasingly common in Europe as well. Developing countries are also showing more interest in these institutions. Companies pay a fee to become members of these programmes and to benefit from the services offered by universities with respect to access to new ideas and projects, events, and to engage more actively in student recruitment. For these institutions to be effective enterprises, they must see many benefits from engaging in such cooperation, and universities must have valuable assets to offer.

Box 11: Industrial Liaison Offices

Industrial Liaison Offices are independent departments in universities that are responsible for the university's relationship with industry, governments and other external institutions. Schaettgen and Werp (1996) point out that the Industrial Liaison Offices could also manage demands to seek out experts on particular subjects inside of the university.

An assessment of Industrial Liaison Offices in Ireland and Sweden has shown that increased partnerships between universities and industry resulted in greater funding for research, and thus greater funding for high-technology equipment (Jones-Evans et al. 1999). Furthermore, teaching and training improved substantially, as it was more focused on solving everyday industrial problems. Recommendations from the assessment point out that there should be more national guidelines on how industry should link with universities.

Kuhlman and Van der Meijden (1989) underline that Industrial Liaison Offices can differ from country to country and from university to university; some Industrial Liaison Offices would focus more on establishing entrepreneurial links with industry or even providing good relationships with industry in order to find jobs for the students, whereas others would focus on technology transfer.

Another channel for stimulating the flow of knowledge between universities and the private sector is by encouraging faculty to spend some time in the private sector, and by valuing private sector experience in the recruitment process. At the same time, interesting opportunities should be created for entrepreneurs to engage in teaching or co-teaching courses at universities. However, as our interviews revealed, as long as universities have a limited endowment for research equipment, a focus on basic rather than applied research, and a strict emphasis on technical education rather than systemic integration of technology with policy and systems analysis, the private sector sees limited benefits from engaging with the higher education sector.

As briefly discussed in the previous section, the **cooperation between research institutes and the private sector** in the field of RE is being stirred by the creation of IRESEN and MAScIR, with a specific mandate in this direction. IRESEN, in particular, is targeting smaller-scale projects in which local companies have greater capabilities to engage. For example, together with OCP and foreign enterprises, IRESEN is exploring how to apply CSP technologies for small-scale pilot projects (approximately 1 MW) in the context of green cities and co-generation. Another project on which IRESEN has cooperated with OCP is the creation of a research, testing and training platform for RE in Ben Guerir over eight hectares, where universities and enterprises conduct experiments with different technologies. To support research on the Ben Guerir platform, IRESEN has also obtained funding from the Korean Agency for International Cooperation to set up a thin-film PV plant with a focus on the whole value chain and on applications in different industrial sectors, such as agriculture.[33]

To stimulate research cooperation between universities and the private sector, IRESEN has issued three main calls for proposals from university researchers, one of the main conditions being that the project is jointly developed with a domestic company. In order to be eligible for such collaborative projects, companies have to be at least two years old and have a minimum of eight employees. While implementing the project, IRESEN performs a constant process of monitoring and evaluation. Currently eight projects are being supported by this programme.

MAScIR has been very successful in initiating research collaborations with the private sector (e.g. OCP, Managem) and internationally (e.g. Aircelle of Safran Group in the aeronautics sector). In the solar energy sector, MAScIR has been working with ADETEL (on the development of trackers, project

33 Interview with IRESEN in Rabat on 25 March 2013.

funded by R&D Maroc[34]) and Cleanergy to apply for one of IRESEN's calls for proposals. In 2012 MAScIR was one of the winners of these grants for an SWH project.

These two research institutes, which have built significant R&D capabilities in a relatively short period of time, should be further supported with research funds, and their activities should be integrated in – and aligned with – the industrial development strategy.

The cluster concept is one channel through which cooperation between public research institutes and the private sector can be geared towards fostering higher levels of industrial competitiveness. Successful industrial clusters have demonstrated that whenever public research institutions and important industrial players have cooperated closely, more innovation capacities have been created, contributing to higher levels of competitiveness. Porter (1990) and others have already shown that for new industrial sectors, leading firms, which are large companies experienced in a certain industry area, oftentimes prefer to locate close to universities in order to access knowledge spillovers, thus permitting the exchange of ideas of different actors and enhancing technological capabilities. Clusters can help in bringing together actors working on innovation, sharing knowledge and improving R&D.

Cluster initiatives are not new in Morocco. MCINET aims to establish 15 clusters by 2015, for which it has created the Fonds d'Appui au Cluster. As a result, currently six clusters are in place: CE3M (a cluster specialising in electronics, mechatronics and mechanics created in 2010, comprising 32 SMEs, five universities and engineering schools, three large enterprises, two professional associations and three thematic commissions); microelectronics; IT (*"numerique"*); two clusters for fishing products; and a cluster for luxury products in Marrakesh.[35]

A cluster initiative for the solar energy sector has recently been initiated by MASEN. Although current efforts are much more focused on the private sector, placing higher importance on bringing public research institutions

34 R&D Maroc, Association Marocaine pour la Recherche-Developpement, is tasked to initiate and promote innovation and R&D in Moroccan enterprises. Financing for R&D Maroc comes from several large companies in Morocco aiming to complement research funds from the Ministry of Education and Research (through the programme INNOVACT) and initiate research programmes that are of interest to large companies (e.g. OCP, Nareva Holding, Air Liquide, DLM).

35 Interview with MCINET in Rabat on 25 March 2013.

to the centre of this cluster initiative could contribute to a more integrated approach for the long-term development of the sector. MASEN's solar cluster initiative is supported by GIZ and has so far been focused on identifying a group of firms to take the lead in the conceptualisation of the cluster. At first, the emphasis was not necessarily on clustering around a specific geographical area, but rather on developing a strong network between different stakeholders based on specific capabilities. As our interview with the Association de Cluster Éléctronique, Mécatronique et Mécanique du Maroc (CE3M) highlighted, the approach that MASEN is taking with the development of the solar energy cluster is more "bottom-up", differing from government-level initiatives that have been used for other sectors, which poses some challenges for this process.[36] However, the initiative is too novel and, hence, too non-transparent for us to draw any conclusions about its effectiveness at this time.

Existing cluster initiatives in Morocco, such as CE3M, work in that direction. In the past couple of years, CE3M has developed interests and activities in the renewable energy sector as well. Its objective is to establish a functioning partnership between universities and the private sector by helping it to identify funding sources for projects. Its mission is to make different actors in specific sectors cooperate on innovative projects in the RE, medical and electronics sectors. The solar sector in Morocco is currently too underdeveloped, with a very limited number of companies manufacturing specific parts and components for solar energy. Therefore, CE3M's approach has been to focus on companies in complementary sectors, such as electronics and mechatronics, and encourage them to enter the solar energy value chain, building on their cluster infrastructure. While these two cluster initiatives – CE3M's and MASEN's solar clusters – work currently in parallel, MASEN's solar cluster concept might profit from the extensive cluster experience of CE3M.

36 Interview with CE3M in Rabat on 25 February 2013.

5.1.3 Policy recommendations

- Align research and education programmes with the industrial development road map that should be elaborated for the solar energy sector.
- Facilitate more structured research funding for universities and research institutes (i.e. funding for equipment, funding for start-ups).
- Foster a strategic approach to cooperation with the private sector, through mechanisms such as Industrial Liaison Offices at universities.
- Promote student internships and dual vocational training programmes with the private sector.
- Strengthen non-engineering educational programmes (e.g. management, economics and entrepreneurship) with respect to RE.
- Integrate private sector engagement standards in faculty and researcher evaluations.
- Integrate universities and research institutes in cluster initiatives for the solar energy sector, and align various cluster initiatives.

5.2 Industrial upgrading programmes

Knowledge and R&D capabilities, as discussed in the previous section, constitute a necessary condition for local companies to improve their products, processes and organisational structures (Bell 2007). However, these are not sufficient – industrial upgrading programmes are needed to enable companies to put these capabilities to use and to create more value. Industrial upgrading refers to a process through which companies move up the value chain by developing higher value-added processes and creating more value-added products (Pietrobelli / Rabellotti 2006). For that purpose, firms progressively build on their organisational capabilities by moving from simple processes to more complicated ones (e.g. to move from assemblers to full-range package suppliers) (Gereffi 1994). This can enable companies to be more attractive partners for TNCs and to benefit from subsequent spillover effects (Altenburg 2000, 35). Three types of upgrading can help a company to move up the value chain: process upgrading, product upgrading and functional upgrading, which refers to the acquisition of a new function in the value chain, such as design or project development (Humphrey / Schmitz 2002, 1020).

As shown in Chapter 4, Morocco's capabilities are rather limited in technology-intensive parts of the value chain. Especially in knowledge-intensive technologies such as CSP and PV, TNCs tend to outcompete local SMEs in scale-intensive and technology-intensive activities. However, at the same time, TNCs depend on specialised SMEs as subcontractors, suppliers, franchisers or after-sales service providers and leave some niche markets to be exploited by local SMEs. To take advantage of these opportunities, local companies have to enhance their capabilities to become attractive partners for TNCs and to engage in business linkages. MASEN also mentioned that, at the current stage of Morocco's industrial development, it is crucial for local SMEs to start as subcontractors to TNCs and move up the value chain with the help of support measures that enable upgrading and knowledge transfer (Discussion with MASEN in Rabat on March 28, 2013). Only then can Moroccan SMEs enter product-engineering processes and create higher value added.

Below we emphasise several crucial factors for industrial upgrading, including the importance of design and engineering capabilities for closing the gap between more basic / scientific knowledge and production-related knowledge. We then discuss existing upgrading programmes in Morocco and highlight policy recommendations for enhancing firm-level capabilities that contribute to achieving higher levels of competitiveness.

5.2.1 Elements of industrial upgrading

Industrial upgrading is a complex undertaking and requires the continuous acquisition of new skills alongside mastery of existing procedures (Azadegan / Wagner 2011, 54). Scientific literature as well as international experience suggests that several factors are decisive for a company's ability to upgrade its performance.

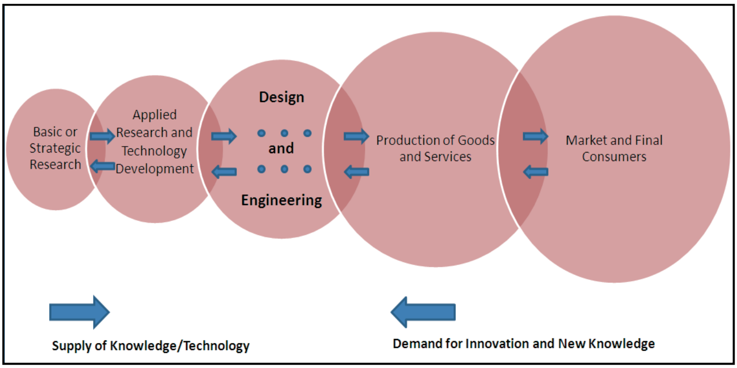
In line with Section 5.1, companies have to improve their knowledge base by tapping into, developing and retaining skilled human resources (Ernst/

Kim 2002). Financial resources are crucial for accumulating, assimilating and internalising new technologies and investing into new machinery (Azadegan / Wagner 2011, 54). Managerial capabilities and growth orientation of the individual entrepreneur and company are also important in this regard.

Adherence to quality standards with respect to products as well as production is important to meet the high-quality requirements of TNCs and ensure the compatibility of supplied products with others in the value chain. Companies can also benefit from quality standards and requirements by receiving guidance on how to improve production processes and products.

Finally, companies have to be endowed with strong design and engineering capabilities. These capabilities are to be distinguished from R&D capabilities (as they refer to a company's ability to transform existing knowledge into new, innovative configurations for new or improved production systems (Bell 2007, v)) and production-related capabilities. Although international experience shows that policies tend to heavily concentrate on strengthening R&D capabilities, design and engineering capabilities are crucial in order to bridge the gap between basic research and production-related knowledge that allows a company to enhance productivity and overall performance (see Figure 9).

Figure 9: Design and engineering capabilities



Source: Bell (2007, 61)

The absence of these factors constitutes internal barriers to the upgrading of companies. Hence, targeted industrial policies for upgrading are necessary to establish a core group of dynamic local companies as potential partners for leading international firms in the solar sector (Altenburg 2000, 35–36; UNIDO 2003, iii).

5.2.2 Upgrading programmes in Morocco

With respect to the solar energy sector in Morocco, interviews with professionals in the private sector and government agencies for industrial support mentioned the following challenges to industrial upgrading: the weakness of middle management and organisational structures; access to finance; the challenge for local SMEs to adjust their production processes to highly demanding international quality standards for complex technologies and to ensure the quality of their own sourcing processes; as well as the general necessity to modernise production processes.

Following our interviews and insights into the operations of our interview partners, we furthermore observed that, so far, only a few Moroccan companies are active as project developers in the RE sector and none in the solar sector. Design and engineering capabilities are also limited, since most companies are active in the distribution, installation and maintenance of solar technologies. It is becoming clear that more companies would have to be active in the areas of design, engineering and project development for the local solar sector to evolve in the higher value-added parts of the value chain. Measures to address these challenges have to be adapted, on the one hand, to the overall business environment and, on the other hand, to the individual enterprise (UNIDO 2003).

Morocco has already established institutions and programmes aimed at SMEs upgrading. The Agence Nationale pour la Promotion de la Petite et Moyenne Entreprise (ANPME), in particular, plays the most important role by offering not only financial but also individual consulting services through their programmes Moussanada and Imtiaz.

Moussanada offers functional support programmes in order to enhance the efforts of SMEs to modernise and improve their competitiveness. ANPME provides funding for services up to 60 per cent, limited to 600,000 MAD per enterprise. The programme is available through three offerings: Moussanada IT, aiming to accelerate the use of IT in SMEs; Moussanada Transverse, optimising support functions such as strategy, marketing and organisation; and Moussanada Sector, fostering the business skills of SMEs, such as production processes, procurement, design and R&D (Fraunhofer ISE 2012, 163). According to ANPME, around 3,000 companies have profited from Moussanada so far.

Imtiaz is designed as a national investment competition for high-potential enterprises with a development project, offering tangible and intangible investment grants that correspond to 20 per cent of the total investment (Fraunhofer ISE 2012, 162). The overall objective is to increase the turnover, export activities, job creation or creation of value added as well as to introduce new technologies or structural changes within the specific sector (ANPME 2013).

ANPME offers individual consulting and support in developing an enterprise-specific "Plan de progress" through its programmes, which allows upgrading strategies to be customised to individual company needs. If interested in advancing its activities, it could thus look at the example of the Small and Medium Industry Development Organization (KOSGEB) in Turkey, which is known to offer comprehensive support for SMEs through its tailor-made support schemes and its broad and decentralised network of support institutions (see Box 12). KOSGEB also offers a decentralised support structure, which is a service that could be relevant to ANPME as well for making its support schemes more accessible to companies across Morocco. ANPME could further benefit from the example of KOSGEB's programmes and develop cooperation with Moroccan institutions responsible for establishing business partnerships or clusters in order to develop and implement a more integrated strategy for increasing SMEs' competitiveness.

Box 12: Small and Medium Industry Development Organization in Turkey

KOSGEB was established in 1990 as a non-profit, semi-autonomous organisation under the Ministry of Industry and Trade, with assistance from the United National Industrial Development Organisation (UNIDO). The agency's task is to improve the efficiency of SMEs and to increase their competitiveness. For that purpose, KOSGEB offers tailored technical assistance programmes, including skills upgrading and accelerated training; promotes closer linkages between larger manufacturing firms and small enterprises as subcontractors or ancillaries; disseminates relevant information to SMEs; supports innovations; encourages entrepreneurship; and directs and orients investments.

KOSGEB is mainly composed of two bodies: policy-maker units and service providers. The policy-maker units provide data analyses and reports on enterprises, conduct studies and market surveys, search and implement new financial models, and analyse and meet the training and consultancy requirements of SMEs. The service providers – Enterprise Development Centers, Technology Development Centres and Synergy Focuses – work directly with SMEs ; strengthen basic relations between industry and government; provide support for KOSGEB; implement projects; provide several test and analysis services for SMEs; and facilitate the establishment of laboratories for SMEs in industrial zones. The 35 countrywide Enterprise Development Centers implement projects and have face-to-face communication with SMEs. KOSGEB's 20 Technology Development Centres function as "Business Incubation Centres" aiming to support technology-oriented development. Their main goal is to decrease the initial costs of start-ups and the failure risks of a developing enterprise.

Support mechanisms offered by KOSGEB service providers can be classified into two groups: support provided under a) KOSGEB Support Regulation and b) SME Credit Support Mechanisms, such as credit programmes for export promotion, IT infrastructure or new employment. Assistance is tailored to specific enterprise needs through the development of an individual Strategic Road Map for each firm that is granted access to KOSGEB services. KOSGEB offers a great variety of different support schemes and strategies that target not only the enhancement of individual firms but also support the creation of business linkages, business clusters and incubators. It is thus able to offer more comprehensive support for SMEs in the process of industrial upgrading.

Source: KOSGEB (2012), YOIKK (2013)

ANPME's activities show that Morocco has taken important steps to create an institutional support system for the industrial upgrading of SMEs. People in the public and private sectors alike who were already familiar with these institutions and programmes confirmed their importance during interviews, but they also mentioned that the support schemes could become simpler and more visible for companies active in the solar energy sector.[37] *"Government support is existing and is sometimes effective, but could be simplified"* said an economist at a Moroccan research institute with respect to ANPME and CMI.[38] So far, however, no company in the solar energy sector has benefited from these programmes, although some enterprises enrolled in Moussanada could – according to ANPME – enter the solar value chain in the future. The reasons why companies in this sector have not used some of ANPME's programmes are not evident. However, interviews with professionals in the private sector suggest that some of these services are not visible enough and that financial support for training, for example, requires a lengthy period for processing. This suggests that existing programmes could benefit from further improvements.

The absence of solar companies in these programmes also suggests that, so far, they are not benefiting from measures to bring their projects up to international quality standards and to have their products certified (Cammett 2007, 1890). To become internationally competitive, however, companies have to offer solar products that adhere to high-quality standards and, thus, should be instructed in a systematic manner on how to adapt to standardisation and quality-management schemes specific to solar technologies, such as the Solar Keymark Certification[39] (GIZ 2013).

There is, however, a recent project by the German Physikalisch-Technische Bundesanstalt (PTB) in cooperation with ADEREE (as well as stakeholders from Tunisia, Algeria and Mauretania) aiming at developing a national quality infrastructure for solar energy. In the beginning, the project will concentrate on SWHs and will support: the development of the necessary competences related to solar energy among the national institutions, the enhancement of the evaluation and testing of SWHs, and awareness-raising

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37 A financing mechanism that would help SMEs to hire consulting companies to improve their management processes was proposed by a big international electricity infrastructure company active in Morocco.

38 Interview with a research institute in Rabat on 25 March 2013.

39 Solar Keymark is a certification scheme created to certify solar thermal products of high quality. It aims at reducing trade barriers and promoting the use of high-quality products. It is a voluntary third-party certification mark that demonstrates to end-users the conformity of a solar thermal product to the relevant European standards as well as additional requirements. This certification scheme is being used in Europe but is increasingly recognised worldwide (ESTIF 2013).

about the importance of quality infrastructure among public and private actors (PTB 2012). Such programmes offer an opportunity for Moroccan companies to benefit from an established quality infrastructure through testing and certification institutions, which are ultimately conducive to industrial upgrading.

Furthermore, reference was made to the need for a clear road map for industrial upgrading, similar to the one applied in other sectors in Morocco such as automotive and aeronautics. Thus, it would be advisable to develop a road map for upgrading the solar sector, as existing programmes and strategies target companies in general and might not be equipped to help companies overcome specific challenges with respect to solar technologies.

In order to enhance design and engineering capabilities, a series of explicit training measures adapted to the company's context have to be conducted. This is a matter of purposeful investment by the enterprise (Bell 2007, vi) and could be facilitated by public institutions through targeted financing support for companies conducting such training activities.

Whereas training measures that stimulate learning opportunities can be conducted by the individual company, design and engineering capabilities can be enhanced further through business linkages with leading firms in the sector, since they can also incorporate training and learning activities centred on these capabilities (Bell 2007).

Large local companies could direct their activities in the solar sector towards project development, since they have the capabilities to move into design and engineering. Interviewees from the public sector suggested that this would be an important step for developing an industry, as there is still a place for Moroccan companies in project development, whereas in other parts of the value chain it is difficult to compete with leading international companies.

Finally, for getting SMEs interested in joining upgrading programmes, a market has to be created for solar technologies, and the upgrading measures have to be targeted towards the requirements of that market (e.g. public tenders).

5.2.3 Policy recommendations

- Enhance the visibility of existing and well-functioning SME upgrading programmes such as the programmes of ANPME.
- Target companies from the solar sector with specific and coordinated upgrading measures that address the sector-specific challenges.
- Support companies in adopting sector-specific quality standards.
- Create a domestic market for solar energy so SMEs can adjust their upgrading process to a specific demand.
- Support enterprise-centred measures (both financially and through consulting) for building design and engineering capabilities.

6 Market creation

As our analytical framework illustrates in Figure 1, market creation is critical for both acquiring technological capabilities as well for attracting private sector investment, both of which are necessary conditions for enabling the formation of business linkages. Market-creation measures are necessary because the demand for solar energy at current (distorted) energy prices is limited.

In this chapter, we provide an overview of the steps already taken to stimulate deployment of solar energy technologies, we discuss in more detail the challenges that Morocco faces with respect to creating a market for solar energy and we provide some policy recommendations for further expanding the market.

Our findings suggest that while Morocco has already sparked considerable international interest in its solar electricity generation market through various market-creation policies, major hurdles remain, thereby increasing the risks to investment and slowing down the process of acquiring technological capabilities. In particular, we point to the lack of regulations for medium- and low-voltage solar projects and the high level of energy subsidies, which impede especially the development of market segments for PV, SWHs and SWPs, where most domestic capabilities are concentrated (see Chapter 4). The drawbacks translate into limited predictability with respect to the size of the market in the medium and long term, which, as we discuss in the next chapters, constrains private sector investment and industrial development.

6.1 Market-creation policies

By adopting its Plan Solaire in 2009, Morocco has created an important signalling device for attracting investors to the area of power generation. The regulatory basis for large-scale solar electricity generation was created through Law 13-09, which opened the high-voltage (and extra-high-voltage) grid to independent power producers (IPPs).[40] Within the existing regulatory framework, the following types of projects can be developed: (i) self-production by industrial investors (mainly large industrial producers) for their own consumption, for projects smaller or equal to 50 MW (some limited amounts of excess electricity may be fed into the grid) (GIZ 2012a); (ii) projects developed by private investors within Law 13-09, aimed at selling electricity to third parties,[41] with the possibility to export; (iii) engineering, procurement and construction contracts with ONEE; (iv) IPPs within a long-term power purchase agreement with ONEE (PWMSP 2012a).[42] As per Law 13-09, the government of Morocco provides a subsidy that covers the difference between the price at which MASEN buys and then sells power. This subsidy is essential for the projects' viability (Falconer / Frisari 2012). The number of projects, however, is limited, because Plan Solaire alone currently is not stimulating a broader movement towards large-scale solar electricity generation in the country.

From a regulatory perspective, the main constraints to the large-scale deployment of solar energy, as per our interview with the Association Marocaine des Industries Solaires et Eoliennes (AMISOLE), are: limited energy market liberalisation, no feed-in-tariff (FIT), no net metering system and

40 Unlike many other developing countries, private producers already generate more than 50 per cent of the country's total electricity needs (CPI 2012).

41 For the commercialisation of electricity produced from RE, the producer has the right of access to the national medium-voltage, high-voltage and extra-high-voltage grid within the limit of available technical capacity. Grid access is guaranteed by Law 13-09 (PWMSP 2012a).

42 More details on the regulatory framework governing different types of electricity generation projects in Morocco can be found at GIZ (2012c).

no possibility to feed surplus electricity into the grid.[43] Further, most interviewees agreed that one of the main constraints to the deployment of solar energy technologies – and hence to industrial development – is the lack of grid access for smaller grid-connected PV plants of 10 kW to 1 MW. Opening the market to small-scale installations of solar power plants within the current framework might significantly enhance opportunities for local companies to participate and gain knowledge in the RE field (Fraunhofer ISE 2012).

Tendering schemes provide the key instruments to enhance RE deployment in Morocco. All large-scale projects must be tendered. Soft support schemes, which we discuss in more detail in the next chapter, include assistance by the Ministry of Finance, the Hassan II Fund, MEMEE and the Energy Investment Agency (PWMSP 2012a). The tendering schemes for solar energy projects are administered by MASEN.

As mentioned by several interviewees, a FIT scheme is not preferred by Moroccan policy-makers. The main reason why policy-makers are reluctant to adopting FITs relates to concerns with their potential inefficiency if the fixed price is too high or too low (due to limited ability of policy-makers to assess the costs of projects and to keep payment levels in line with fluctuating energy generation costs) (OECD 2013c). A second reason is that policy-makers in Morocco (as in other MENA countries) are wary of passing the costs of FITs to consumers (as per the approach followed by Germany), as electricity prices are already high – relative to other countries in the MENA region – and concerns about social instability are pervasive. This would mean that the additional costs would have to be covered by the government budget, which would further increase its financial burden. As a result, the FIT remains an unattractive policy instrument for Morocco, in spite of it being used in several other MENA countries.[44]

An alternative policy instrument that would not burden the government budget – and that is gaining support among policy-makers in Morocco – is

43 Interview with AMISOLE in Casablanca on 12 February 2013.

44 In 2012 the Palestinian Territories implemented a new FIT with technology-differentiated tariffs to support wind, PV, CSP, biomass and biogas projects; Syria enacted a new FIT to complement the 2010 RE law; Israel revised its FIT to reduce solar and wind tariffs; Jordan enacted a new FIT in late 2012 to complement the Renewable Energy and Energy Efficiency Law passed earlier in the year; Malta, Algeria and Iran also enacted FITs (REN21 2013).

net metering. Net metering is a mechanism that encourages consumers to produce their own electricity from RE sources and sell any surplus production at a certain tariff (OECD 2013c, 59), leading to a smoothening of the demand curve. To this end, a device (a meter), which is set to turn backwards, counts the bi-directional flow of electricity between the distribution grid and customer-side generating units. It then determines the price difference, allowing the government to subsidise only the excess energy produced (OECD 2013c, 59). A study conducted by GIZ in 2011 shows that in Morocco, within a net metering scheme, PV is already competitive with purchased electricity (GIZ 2012c). As part of GIZ's efforts to promote such regulation, the proposal of a "1 million roofs programme" is being developed with the support of GIZ. The main constraint of the net metering scheme in Morocco is the limited investment capacity of households. Therefore, the government should create incentives, such as a "solar credit" programme, that would help households to invest in the necessary equipment (GIZ 2012a).

Net metering has been applied in various countries, especially in the United States, Australia, Japan, Mexico and Thailand. Box 13 shows a good-practice example from the state of Colorado in the United States that is currently considered to be the most successful example of applying this policy instrument. Egypt is also in the process of implementing a net metering system, based on which the metering system will be supplied by the relevant electricity distribution company (while the subscriber will bear its costs) (RCREEE 2013). It is too early, however, to assess the effectiveness of this programme in Egypt. Jordan, Lebanon, Malta, Syria and Tunisia have implemented net metering schemes, but little information exists with respect to how successful these programmes have been (REN21 2013).

Box 13: Colorado's net metering scheme

Colorado's net metering policy, established in 2004 and subsequently amended, is widely considered to be one of the best in the United States. Colorado allows net metering for systems sized up to 120 per cent of the customer's average annual consumption for all customers of investor-owned utilities. For customers of municipal utilities and electric cooperatives, the limits are 10 kW for residential systems and 25 kW for non-residential systems. There is no stated limit on the aggregate net metering capacity in Colorado. Any net excess electricity generated by a customer during a billing period is carried forward to the customer's next bill as a full kWh credit (i.e. at the utility's retail rate). At the end of a 12-month period, the utility purchases any remaining excess electricity from the customer at a rate lower than the retail rate. Alternatively, customers can choose to roll over the net excess generation credits indefinitely. Customers own the Renewable Energy Credits associated with the electricity they generate.

Source: OECD (2013c, 60)

In order for the PV market to take off, AMISOLE argues that the restructuring of the public utility, ONEE, is also necessary, but it is not expected to be completed before 2014 or 2015. The most important aspect relates to removing the regulatory responsibility from ONEE and creating an independent regulatory agency.[45] Egypt is also confronted with a similar problem (Vidican 2012a).

With respect to market expansion for decentralised solar energy generation, one challenge relates to the structure of the energy market, in particular with respect to the distribution of electricity (and water). Currently, the distribution of electricity is divided between ONEE (which has a monopoly over high- and very-high-voltage projects) and private distributors and municipal *régies* (with whom ONEE has contracts for 30 years), which are governed not by MEMEE but by the Ministry of the Interior. Currently there are 13 independent private distributors. These electricity distributors buy electricity from ONEE and sell it to consumers at higher prices. Among these, three are fully responsible for the public administration of the distribution of water and electricity in the five largest cities (GIZ 2012c):

- LYDEC in Casablanca, part of the group Lyonnaise des Eaux;
- REDAL in Rabat and Salé, part of the group Veolia;
- AMENDIS in Tangier and Tétouan, part of the group Veolia.

45 Various interviews also pointed towards the major financial challenges that ONEE is confronting, thereby preventing it from major investments in upgrading the grid infrastructure.

Given this structure of the energy system for distribution, private distributors (including *régies*) have a disincentive to support decentralised solar energy generation, as they would lose an important share of their customers to whom they are currently selling electricity. As one of our interviewee mentioned "[t]*heir profit margin comes primarily from residential customers that consume higher level of energy, the higher income groups. These customers are also the ones that would afford to put PV panels on the roof. Therefore, they are not keen to lose this market segment."*[46] From another perspective, *"if private distributors companies and régies lose the medium voltage market segment* [which represents 50 per cent of their sales] *prices will increase; this would automatically be vetoed by the Ministry of the Interior."*[47] As ONEE further argued, private distributors claim that *"tariffs would increase by 50%, which means that they would have to sell at a negative margin."*[48] Another problem related to private distributors is that because *"they gain their profit margin by selling more electricity they are really not interested in energy efficiency either. Hence, there is a problematic relationship between ONEE and other distributors – they are not interested in optimising their system."*[49] One way to solve these problems is to have an independent regulator, as emphasised above, who can decide what needs to be done and how to implement certain requirements. Only then could a regulatory framework for supporting the deployment of a decentralised solar energy system be implemented.

Opportunities for expanding the market for solar energy should also be explored outside of Morocco. Solar equipment manufacturers could benefit from current dynamics and future prospects in the broader MENA region. The regional context and the idea of "Morocco as a hub" might render manufacturers' prospects more brightly, as the country has signed a significant number of free trade agreements. The MENA region has recently experienced a surge in nationwide programmes targeting a broader deployment of RE. In February 2013, for instance, Saudi Arabia announced plans to produce 41 GW of solar energy by the year 2032, which means that a third of its total domestic energy consumption would be covered by renewable sources (Arab News 2013).

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46 Interview with an energy consultant in Marrakech on 13 February 2013.

47 Interview with ONEE in Casablanca on 21 February 2013.

48 Ibid.

49 Ibid.

Further opportunities arise in West Africa. Representatives of ONEE emphasised Morocco's potential to *"become a regional hub especially for sub-Saharan Africa."*[50] Moroccan products have a good reputation among its southern neighbours, while the country is apparently *"very well appreciated in Africa"*. Among West African nations, Morocco has gained a reputation for its rural electrification programme PERG,[51] which was initiated in 1996 and succeeded in achieving near-universal electrical power supply throughout the country. Although the programme was low-tech – whereby the grid was simply expanded – technological capabilities (e.g. in the field of off-grid solar electricity production) were acquired during the programme by Moroccan manufacturers. Taking advantage of this position, there is potential for Morocco to play a more active role as (1) a facilitator of low-carbon development in the South, and (2) an ambassador for decentralised solar rural electrification, while fostering Moroccan exports of parts and components at the same time.

6.2 Energy subsidies

Aside from the challenges related to the regulatory framework discussed above, our interviewees were almost unanimous in their assessment that the high level of energy subsidies hampers especially the development of a market for decentralised PV systems (rooftop PV), SWHs and SWPs. These market segments, as mentioned before, are also areas where local SMEs have a greater ability to enter the solar energy sector.

Because energy prices are among the highest, relative to other countries in the MENA region, energy subsidies have increased continuously in Morocco (Vidican s.a.). As Table 12 shows, the level of subsidization is quite high, especially for butane gas / liquefied petroleum gas (LPG). With the international price of butane rising since 2000 and the retail price remaining fixed, by 2007 the subsidy had increased to about 377 million EUR annually, equivalent to 20 per cent of the government investment budget (World Bank 2007).

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50 Ibid.

51 See Section 3.3 for a more detailed discussion.

Table 12: Subsidies for energy products in Morocco (July 2012)

	Import price / cost	Domestic sales price	Subsidy	
	MAD (EUR)	MAD (EUR)	MAD	% of sales price
Gasoil (MAD/l)	12.83 (1.10)	8.15 (0.75)	4.68	66%
Unleaded petrol (MAD/l)	15.82 (1.44)	12.20 (1.10)	3.62	35%
Butane gas, 12 kg (MAD/bottle)	140 (12.7)	40 (3.60)	100	250%
Butane gas, 3 kg (MAD/bottle)	35 (3.2)	10 (0.90)	25	250%
Industrial fuel (MAD/T)	8,016 (729)	4,666 (424)	3,350	91%
Standard-quality fuel oil for electricity generation (DH/T)	6,815 (619)	2,385 (216)	4,430	185%
Superior-quality fuel oil for electricity generation (MAD/T)	7,988 (726)	2,600 (236)	5,388	267%
Natural gas for domestic use (MAD/tep)	-	-	-	-
Electricity for domestic use (MAD/kwh)	NA	1.05* (0.095)	NA	-

Note: *For consumption between 201 and 500 kWh / month
NA = not available
Exchange rate: 1 EUR=11.01 MAD
Source: PWMSP (2013)

Butane gas is used extensively by all consumers for cooking. But because it is heavily subsidised, butane has also been extensively used for water heating and for water pumping in agriculture. Therefore, the use of butane gas for these applications creates a strong price disadvantage for solar energy applications in these market segments.

One major challenge with energy subsidies is that, although their main justification is to support the low-income population groups, they benefit disproportionally the middle and upper classes. Given the social and political tensions in the MENA region following the Arab Spring uprisings, delays with the reform have been omnipresent.

The reform of energy subsidies is, therefore, highly political (for a more extensive discussion on the Moroccan context, see Vidican (s.a.)). Action on subsidies is taken by a Parliamentary commission specifically assigned for this purpose.[52] One interviewee who has been a part of this commission argued that he *"faced lots of opposition from politicians who were afraid of social unrest...as a result subsidies were further increased rather than cut down."*[53] Another interviewee, at MEMEE, mentioned that the main concerns for the government are the poor, the middle classes and social stability. Although subsidies should be targeted more efficiently to exclude the rich, the government is still looking for the right way to realise this goal. Hence, *"the question remains on how to balance all these aspects (the poor and the risk of social upheaval, Constitutional rights – the middle classes are protected by the Constitution, and avoidance of fraud – the use of butane for various other applications, in agriculture for example, when it was intended for cooking only)."*[54]

In spite of these political challenges, interest in reforming the energy subsidy scheme is high in Morocco. ADEREE, for example, has been very active in liaising with various stakeholders to promote the deployment of SWHs and explaining the irrationality of energy subsidies, especially for the higher-income population groups. At the same time, however, specific programmes need to be put in place to support those who cannot afford to buy a SWH:

> [w]*hen you buy SWHs today you have two choices. An LPG-one would cost US$ 200 and this is four times less than SWHs. So if you want to have people buying SWHs then you need to give incentives for that. Or you need to have a programme – this is what we are doing with the Ministry of Habitat, because solar housing is under development, we are building more than 100,000 houses per year and we are discussing with the Ministry of Habitat to do the pre-installations of SWHs. So at least when someone moves into the building we can add SWHs. If the pre-installation is not included in the beginning, it is difficult.*[55]

52 Interview with an energy consultant in Marrakech on 13 February 2013.

53 Ibid.

54 Interview with MEMEE in Rabat on 20 February 2013.

55 Interview with ADEREE in Rabat on 13 March 2013.

Such a programme cannot, however, be implemented without reforming energy subsidies first. The challenge, however, is how to reform energy subsidies by targeting subsidies more efficiently to those who really need them (the low-income population groups) or by providing universal compensation schemes.

6.3 Policy recommendations

- Open the market for medium- and low-voltage projects.
- Create an independent energy system regulator authority.
- Target energy subsidies more efficiently.
- Adopt policy instruments to support the deployment of decentralised solar energy systems, such as net metering.
- Position Morocco as an ambassador for solar-based rural electrification in the West African market and introduce necessary trade facilitation measures.

7 Mobilising private sector investment

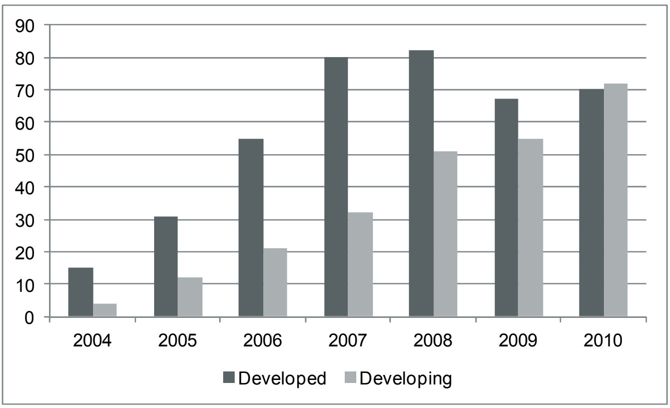
As our conceptual framework illustrates, aside from the presence of a large market for solar energy technologies and for strong technological capabilities, mobilising private investment (both FDI and domestic investment[56]) is critical for Morocco's efforts to develop the solar energy sector and to enhance its competitiveness. High levels of investment are needed to both boost solar electricity generation as well as to support the development of a local industry (i.e. manufacturing of parts and components for solar energy). Morocco's solar energy industry will only reach a take-off point once considerable investments in production facilities as well as research and development activities have been made.

56 We focus primarily on TNCs when discussing FDI and on Moroccan SMEs when discussing domestic investment. Large Moroccan companies have both a remarkably different investment rationale and easier access to finance; therefore, we have not included them in this discussion.

Global investment into RE has gained momentum. In 2010, investment targeting RE across the globe reached US$ 211 billion (UNEP / Bloomberg New Energy Finance 2011). At the same time, a fundamental shift has taken place in global RE investment patterns: although developed economies dominated the scene in the past, developing countries (including China) have recently surpassed them to take the lead in RE investment (see Figure 10). Currently, investors with a considerable amount of liquidity are seeking new and profitable economic ventures, as RE increasingly offers profitable opportunities due to policies supporting the energy transition. Morocco can potentially gain from these dynamics if it succeeds in positioning itself as an attractive investment location.

In recent years, there has been increasing interest among TNCs to invest in solar energy in Morocco. Greater attention paid towards the Moroccan solar sector, meanwhile, reflects a more general trend in the region. A recent OECD report explains that *"investing in RE projects in MENA would allow companies to build leadership in the field and secure first-mover advantages"* (OECD 2013c). Although the solar energy sector in most MENA countries, including Morocco, is still under development, expectations are high that the market will grow, as discussed in the previous chapter.

Figure 10: New financial investments in renewable energy: developed versus developing countries, 2004–2010 (billion US$)



Source: UNEP and Bloomberg New Energy Finance (2011)

The country's success in developing its domestic solar energy sector hinges to a large extent on its ability to attract TNCs, which play a crucial role as investors. More fundamentally, TNCs are key providers of know-how and technology and offer the potential for spillover effects to domestic SMEs. Hence, private investment constitutes a necessary – though by far insufficient – precondition for business linkages (which we discuss in more detail in Chapter 8) to develop. It is therefore crucial to channel private investment towards creating business linkages and achieving inclusive competitiveness.

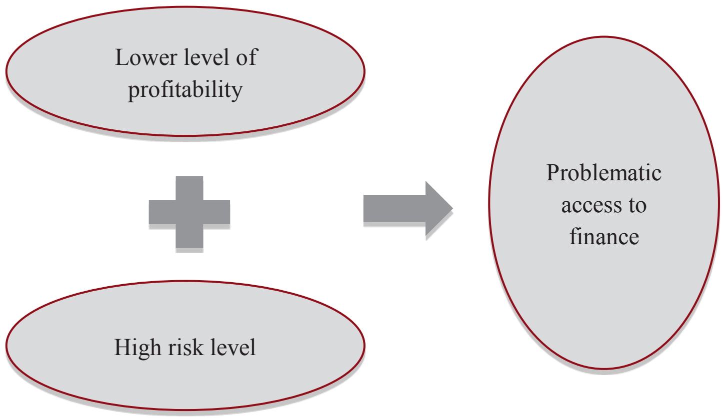
We start with an overview of the key challenges for RE investments in MENA, followed by a discussion of two main issues related to private sector investment in the emerging solar energy sector in Morocco: investment promotion (how to attract private investment in the sector), and investment financing (how to finance this investment by using different sources and mechanisms). Aspects of how to guide this investment to best support business linkages between TNCs and local companies are further elaborated upon in Chapter 8. We conclude that although access to finance might not be as problematic, the real challenge is to ensure bankability of projects, improve investment promotion and facilitation, and identify new financing mechanisms. More important, however, is the need to have a large market for solar energy.

7.1 Key challenges for renewable energy investments in MENA

One of the biggest challenges for greater RE deployment in the MENA region is to overcome the hesitation to invest in electricity generation and manufacturing projects. This is mainly due to two key challenges of investing in RE in the region, which consequently lead to lower access to financing: the lower level of profitability of RE projects and the associated high risks (see Figure 11).

The lower level of profitability for RE projects is a problem encountered around the globe. In most cases, energy production from RE sources is still more expensive in comparison to traditional means of production, especially when externalities are not accounted for. Costs for non-RE typically range from US$ 0.03 to 0.10 per kWh, whereas energy produced from renewable sources is not only more costly in most cases, but often also shows a far greater cost range (Griffith-Jones / Ocampo / Spratt 2012). Most RE

Figure 11: Key challenges for renewable energy investment in MENA



Source: Own illustration based on (OECD 2013c)

technologies *"are still at the early commercial development stage"* (OECD 2013c, 45), which means that they will move down the cost curve over time. Additionally, a predicted sharp price increase for fossil fuels will improve the renewables' relative profitability (OECD 2013c, 45).

In the MENA region, concerns with profitability are aggravated by lower prices for conventional electricity. In many countries, electricity prices *"tend to be too low to enable the investor to recover the cost of generating electricity from renewable sources"* (OECD 2013c, 45) due to high fossil-fuel subsidies (Fattouh / El-Katiri 2012). This further worsens the prospects for the profitability of most RE technologies and points to a strong necessity for government support to broaden the deployment of renewables. As mentioned by a local bank in Morocco, *"the challenge is to demonstrate that the project is bankable and has a good business plan. Then banks are interested to finance, regardless of the sector and technology."*[57]

57 Interview with the representative of a domestic bank in Casablanca on 11 March 2013.

Moreover, RE projects are often characterised by a high level of risk. As RE technologies tend to be capital-intensive and costly, they require lengthy payback periods, between 8 and 17 years. The typical structure of an RE business plan is characterised by *"high up-front costs and small operating costs"* (OECD 2013c). Hence, investors depend on strong guarantees by the contracting entity to ensure a continuous flow of income from the project as well as to ensure political and economic stability to secure a conducive environment for the project. OECD (2013c) classifies the risks involved as follows: (1) client risks, (2) political and regulatory risks, (3) market risks, (4) technology risks associated with the novelty of the technology.

The above-mentioned lower level of profitability as well as the high risks involved often result in reluctance on the side of commercial banks and other private financial actors to provide funding for RE projects. Literature suggests that *"the immaturity of the RE sector increases the difficulties associated with accurately pricing relative risk of investments in clean energy, making it more difficult for these technologies to obtain financing at reasonable costs than for fossil fuel technologies"* (Kalamova / Kaminker / Johnstone 2011, 8).

Morocco is not exempt from these challenges. Representatives of MCINET pointed out that there is still a great hesitancy to invest in solar energy because investors are unwilling to invest without a reasonable level of assurance.[58] More specifically, interviewees mentioned the problem of extensive delays in payments for energy by public customers, which might be easier for larger corporations to manage, but it is more problematic for smaller companies.

Nevertheless, Morocco has already put in place some effective measures to mobilise private investment and ensure the necessary funding. These measures are discussed and assessed in further detail below. This is followed by policy recommendations for improving their effectiveness.

7.2 Investment promotion and facilitation

Renewable energy projects need a sound policy framework and well-targeted support mechanisms (OECD 2013c). From the investors' perspectives, the general investment climate in Morocco has slightly worsened in the past

58 Interview with MCINET in Rabat on 26 February 2013.

12 months. Two major ratings agencies – Standard & Poor's and Moody's – have recently downgraded their outlook for Morocco (GCR 2013; Morocco World News 2012). Dominant among the reasons mentioned were the country's deteriorating fiscal metrics, especially its twin-deficit.[59] Nevertheless, a recent World Bank report emphasises *"the remarkable resilience of investor interest in the* [MENA] *region despite recent challenges"* (World Bank 2013a, 11).

At the same time, however, enthusiasm prevails with regards to solar energy. According to a representative of the banking sector, Morocco *"belongs to the most interesting markets worldwide for solar – especially within the region."*[60] A representative of a major foreign energy corporation emphasised that *"the Moroccan project is probably one of the best developed among the developing countries today."*[61] Investors endorse the country's clear political will to embark on broader low-carbon development and are interested in being part of Morocco's energy transition. International interest in the country in the field of solar energy is further underscored by the location choices of major conferences such as the World Investment Conference North Africa (which took place in Marrakesh in March 2013) or the 4th Dii Desert Energy Conference (which will take place in Rabat in October 2013), which *inter alia* highlight related investment opportunities.

7.2.1 Determinants for investment in renewable energy projects

As described in Hanni et al. (2011), the determinants for foreign investment in RE projects can be grouped into three main categories: the general policy framework, economic determinants (i.e. market seeking, natural resource seeking, strategic asset seeking), and promotion and facilitation. For the purposes of this study, we also include domestic private investment in the discussion since, in general, it follows the same rationale.

The potential determinants for investment in RE projects differ, however, between RE generation and manufacturing projects (Hanni et al. 2011). One main difference arises in the general policy framework; for energy genera-

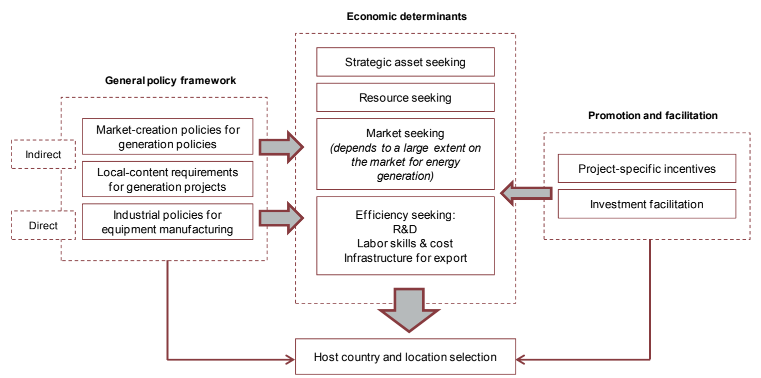
59 Morocco now has a current account deficit and a fiscal deficit simultaneously.

60 Interview with a bank representative in Rabat on 21 February 2013.

61 Interview with a large foreign company in Marrakech on 21 March 2013.

tion projects, the FDI policies and energy policies (market-creation policies and market regulation) matter most, whereas for manufacturing projects, additional types of policies matter as well (such as industrial policies). Given our concern with achieving inclusive competitiveness in the emerging solar energy sector in Morocco – and hence expanding opportunities for localising the value chain for this technology – in this section we focus specifically on determinants for investment in renewable energy equipment manufacturing.

Figure 12: Determinants for investment in renewable energy equipment manufacturing



Source: Hanni et al. (2011)

As Figure 12 shows, among the factors related to the general policy framework, the most important relate to the market-creation policies and local content requirements for generation projects; and industrial policies for equipment manufacturing. As we discuss these policies in more detail in other chapters (market-creation policies in Chapter 6, local content requirements in Chapter 8, and industrial policies in Chapters 5 and 8), here we primarily focus on programmes and policies related to investment promotion and facilitation (i.e. project-specific incentives and investment facilitation programmes), and conclude with some policy recommendations.

Before getting into specifics of promotion and facilitation measures, it is important to mention that private investors with a background in RE equipment manufacturing face similar problems as those seeking electricity generation projects, as the market for parts and components largely parallels the market for solar electricity generation. The small number of projects, the perceived uncertainty with respect to the types of solar technologies to be used in upcoming projects – as MASEN applies a step-by-step approach testing different technologies – as well as the still relatively short time-horizon of Plan Solaire all deprive private investors to a large extent of a solid long-term economic basis for investments in manufacturing locations. A representative of a large enterprise emphasised that *"more visibility with regard to the Plan Solaire and the planned technologies"* is required.[62] Another major Moroccan steel company supports this notion of a lack of market visibility (referring to predictability and size of the market) by pointing out that *"nothing is clear after the 2nd phase of Ouarzazate* (…) [which] *makes investment difficult and hinders the development of a market."*[63] Hence, enhancing market size and predictability (by providing a road map with respect to the types of technologies of interest to Morocco and the market beyond 2020) is critical for attracting investors to this emerging market.

7.2.1.1 Project-specific incentives

At a more general level, the legal and regulatory conditions for making investments in the Moroccan solar energy sector are positive. In contrast to many other countries, Morocco allows solar electricity generators ownership on a basis of "build, own, operate and transfer"; various international conventions have been signed, as well as a growing number of bilateral investment agreements.[64] The challenge, however, remains in providing targeted project-specific incentives.

Yet, in the eyes of investors incentives are considered to be "less important" (Hanni et al. 2011, 53) as compared to previously discussed points, especially the investment climate and the existence of a market. Nevertheless,

62 Interview with a large company in Casablanca on 20 February, 2013.

63 Interview with DLM in Casablanca on 12 March, 2013.

64 Among the international conventions that have been signed are: the International Centre for Settlement of Investment Disputes, the Multilateral Investment Guarantee Agency and the Inter-Arab Investment Guarantee Corporation. According to the Moroccan Investment Development Agency (AMDI), *"many treaties, agreements and conventions for the promotion and protection of investments and avoidance of double taxation have been signed throughout the recent decades"* (AMDI 2013c).

thoughtfully devised incentives can attract investors' attention, speed up decision-making processes and in some cases constitute the final missing piece in the puzzle of a location choice. Literature suggests that *"the presence of such policies is* (…) *highly correlated with renewable electricity generation greenfield investments, with 85 per cent of projects being located in countries with at least one business facilitation measure"* (Hanni et al. 2011, 53). Hence, Morocco should consider regular reviews and updates of its investment incentives scheme.

Morocco already offers a comprehensive set of incentives to attract FDI. The current system is (to a great extent) in line with international standards. Among the incentives are non-RE-specific measures (such as support from a fund for investment promotion or certain tax and custom advantages); an attractive law regime (featuring corporate tax exemptions and free repatriation of profits and capital for non-residents for amounts invested in foreign currency); as well as sector-specific incentives (see Box 14).

Box 14: Incentives for the promotion of solar energy in Morocco

Morocco offers sector-specific incentives for the promotion of its domestic solar industry. They comprise:

1. Benefits stemming from free zone status granted to export-oriented RE industries conceding up to 30 per cent of sales realised in the local market.
2. Investment grants funded through the 400 million MAD (about US$ 48 million) channelled through the Fonds de Développement Energétique. One of the eligibility conditions for these grants is to make new investments in manufacturing parts and components for RE and energy-efficiency technologies. Eligible investment projects can benefit from a contribution of 10 per cent of the acquisition cost of new capital goods, up to 20 million MAD. Additional direct financial assistance can be attained if investment plans are located in regions or geographical areas where the government plans to develop clusters.
3. Support for training and hiring through the Agence Nationale de Promotion de l'Emploi et des Compétences. For hiring, the state provides a cost-contribution amounting to 15,000 MAD (1,320 EUR) for an operator, 20,000 MAD (1,764 EUR) for a technician, and

40,000 MAD (3,528 EUR) for an engineer. Continuous in-company training measures are supported with 5,000 MAD (441 EUR) for an operator, 10,000 MAD (882 EUR) for a technician, and 20,000 MAD (1,764 EUR) for an engineer.

Source: Mezouar / Benkhadra / Chami (2011), AMDI (2013b)

Aside from these incentives, customised for investments in the solar energy sector, other incentives also exist, especially for investments larger than 200 million MAD. These incentives address access to land (20 per cent reduction in the cost of acquisition), infrastructure, training, as well as VAT exemption for three years and customs duties exemption for three years (AMDI 2013a).

As our interviews revealed, these incentives have been beneficial to investors, but more effective targeting and communication are necessary. For large investors, this is not so much a problem, as they liaise directly with MCINET, which informs them about package incentives. As discussed in Chapter 5, the challenge is mostly for smaller investors, who cannot easily access this information. Also, targeting these incentives more efficiently to companies in the solar energy sector is necessary. However, it is critical to emphasise that without a strong market-creation policy framework, project-specific incentives are not very effective in attracting high levels of private sector investment. This also explains the concern that MCINET expressed with respect to the limited investment in the sector (aside from the Ouarzazate CSP plant), in spite of the incentives package that Morocco is currently offering.[65]

7.2.1.2 Investment facilitation

Aside from project-related incentives, facilitation measures are also important to inform potential investors of existing opportunities and to generate interest in a particular sector. Such measures could include: information-specific opportunities in a certain sector, matchmaking, one-stop-shopping services, etc. (Hanni et al. 2011).

Morocco's investment-promotion and facilitation system has undergone a major institutional overhaul. Up until February 2009, when the Moroccan

65 Interview with MCINET in Rabat on 26 February 2013.

Investment Development Agency (AMDI) was founded, the Directorate of Investment in the Ministry of Economic and General Affairs had been responsible for attracting foreign investment to Morocco. The Directorate of Investment has also been in charge of steering the Inter-Ministerial Investment Commission, which is an appeal and arbitration body headed by the Prime Minister. The Inter-Ministerial Investment Commission, which still exists, continues to be advantageous to the extent that it facilitates promoting change due to the body's prominent institutional placement.[66] At the same time, however, the Directorate of Investment suffered from a lack of *"adequate autonomy to perform high levels of advocacy"* (OECD 2005, 23) due to its longstanding status as a ministerial department. Moreover, opportunities for private sector involvement were limited under the former structure.

More recent changes in the institutional set-up have resulted in remarkable progress. AMDI was established as a financially autonomous public institution, bringing in AMDI's board of directors representatives from business associations, such as the Fédérations des Chambres Professionelles and the Confédération Générale des Entreprises du Maroc (CGEM). The set-up of AMDI is explicitly mentioned as a "good practice" in the World Bank's recent *Global Investment Promotion Best Practices 2012* (GIPB) report and was lauded for significantly improving its online investor information services. In fact, it earned the credit of being the "Most Improved Web Site in MENA Region in GIPB 2012" (World Bank 2013a, 22). Moreover, AMDI remarkably enhanced inquiry handling by developing *"an integrated approach to handling investor inquiries, which entails a centralised management of all requests for information received through a dedicated structure"* (World Bank 2013a, 33).

Nevertheless, there is still space for improvement. Further steps should be taken that adapt other good practices from the region, as had already been done in the case of AMDI's above-mentioned inquiry-handling process, in which the agency learnt from other investment-promotion institution proceedings. Providing investors with even more sector-specific information should be prioritised, as it clearly improves Morocco's future chances to be considered in speedy short-listing decisions.

66 Interview with AMDI in Rabat on 15 March 2013.

Furthermore, matchmaking at the overall as well as the sector level should be further enhanced,[67] and the forming of stronger partnerships with other investment-promotion institutions as well as domestic institutions should be considered more broadly. Finally, capacity-building measures for the CRIs – which complement AMDI's outward-looking work at the sub-national level, revealing varying degrees of efficiency – could be envisaged. All this should be done in a way that reflects the strategic role that the solar energy sector plays for industrial development in Morocco. Nevertheless, facilitating investment and servicing new and existing investors is necessary at all stages of the investment cycle, from start-up through to the post-investment and new expansion stages. What becomes evident is also that a clear strategy for promoting investment in the solar energy sector is currently lacking in Morocco, which integrates the targets for energy generation with existing resources and capabilities (we discuss this issue in more detail in Chapter 9).

A good practice in the region worth looking at in this context is the Tunisian Foreign Investment Promotion Agency's (FIPA) online sector information service (see Box 15).

Box 15: The Tunisian FIPA's online sector information service

The World Bank report *Global Investment Best Practices 2012* refers to the website of the Tunisian Foreign Investment Promotion Agency as a best practice in providing sector information.

The agency's online content, which is available in eight languages (Arabic, Chinese, English, French, German, Italian, Japanese and Spanish), provides the potential investor with comprehensive and decision-relevant information on six selected sectors (food, mechanical, leather and shoes, electricity/electronics, information and communications technology (ICT), and textiles). The breadth of information presented as well as the ease with which users can access the information suggests a deep understanding of investors' information needs and search habits.

67 See Section 8.2 for a more comprehensive discussion.

For each sector, multiple pages are available comprising:

1. a general presentation containing basic data and figures (production, employment, exports, etc.);
2. an appraisal of Tunisia's assets, listing key location advantages and depicting the country's competitiveness in comparison to other potential investment destinations;
3. a list of opportunities for investors that takes the shape of an online database pointing potential investors to a variety of openings, including privatisation projects;
4. a collection of success stories in the form of a list showing all the major investors that currently have a presence in Tunisia;
5. testimonies that underscore some positive aspects of operating in the Tunisian environment.

This online service allows a potential investor to attain a fair overview of costs and conditions in Tunisia for a specific sector of interest in a very short time.

Source: FIPA-Tunisia (2013), World Bank (2013b)

In general, key elements of good practice for investment-promotion and facilitation agencies include (OECD 2005):

- *"Having a good service management system which aims its activity at priority market segments/sectors, spells out the service offered and is clear on the delivery method;*
- *Using customised marketing to target clients and build relationships with them;*
- *Pursuing FDI in all elements of the value chain and in all business functions (e.g. design, purchasing, production, distribution, marketing, customer aftercare and service, R&D);*
- *Rooting FDI in the host country through good linkage with local suppliers, subcontractors, business partners, technical institutes and universities, etc., and through good facilitation in the post-investment phase."*

7.2.2 Policy recommendations

- Expand investment incentives for domestic SMEs.
- Provide investors with detailed sector-specific and up-to-date information and improve inquiry handling.
- Augment investment facilitation services, including effective matchmaking targeted specifically to the solar energy sector.
- Develop a technology road map for the medium and long term.

7.3 Investment financing

The second issue related to mobilising private sector investment is how to finance this investment by using different sources and mechanisms. Our interviews suggest that although access to financing (i.e. liquidity) does not seem to be problematic *per se* (high levels of investment from development banks and the presence of solid local banks), the key challenges emerge from: lack of bankable projects, few instances of lending to RE projects, and lack of guarantees or subsidies for interest rates.

Below we provide an overview of the key players in the financial sector in Morocco and their activities in the RE sector before discussing the effectiveness of various financing mechanisms. However, since this topic is secondary to our study, we provide only a very limited assessment of these issues. Further research is needed to explore these aspects in more detail and identify opportunities for improvement.

7.3.1 The Moroccan banking sector

Morocco benefits from a relatively strong and stable banking sector, comprising 19 banks and 37 lending institutions. In its medium-term economic and social programme for 2007–2012, the government had explicitly committed to reforming the banking sector by (1) facilitating access by SMEs to sources of finance, (2) strengthening supervision and control of the financial market and insurance sector, (3) revitalising the insurance sector, (4) developing venture capital, (5) encouraging micro-credit and promoting small business development. Morocco's stronger banking sector and access to credit status, relative to other countries in the MENA region, is also made evident in Table 13.

Table 13: Ratings for banking market indicators and access to credit

	Morocco	Tunisia	Egypt	Jordan
Liquid liabilities to GDP (2008–2010)	102%	59%	81%	119%
Getting credit rank (out of 185)	104	104	83	167
Depth of credit information (6=best)	5	5	6	2
Availability of financial services (7=best)	4.74	-	4.21	4.64
Affordability of financial services (7=best)	4.37	-	4.09	4.4

Source: Dii (2013a) based on various sources

As RE is a relatively new field in Morocco, the banking sector is not yet actively engaged in financing solar energy projects. Representatives of Moroccan business associations pointed out that some local banks have RE credit lines, but a more active interest in the green economy is still missing.[68]

In recent years local banks have been especially interested in financing wind energy projects, particularly Attijariwafa Bank, Banque Populaire and Banque Marocaine du Commerce Extérieur, allowing them to build up project-finance expertise concomitantly. Among the smaller local banks are BMCI, Crédit du Maroc and Crédit Agricole.

According to a major Moroccan developer, Moroccan banks provided a total of 400 million EUR in loans for the corporation's Tarfaya wind project,

68 Interview with AMISOLE in Casablanca on 12 February 2013.

displaying higher levels of competitiveness than European banks suffering from the Euro crisis.[69]

Despite this general openness towards RE investment financing, an apparent hesitation to get involved in industrial financing, paired with the underdeveloped state of some of the necessary financing instruments, prevents the Moroccan banking sector from developing its full potential. Representatives of Moroccan SMEs lamented a seeming lack of industrial culture within the country's financial sector, stating that lending is heavily skewed towards real estate. Moreover, various interviewees from the private sector mentioned that the availability of financial instruments specifically relevant to the energy industry, such as leasing or long-term rent schemes, is still weak.

Credit lines for SMEs (irrespective of the sector of activity) are accessible,[70] but interest rates are quite high and more targeted financing instruments are needed to reduce the risks of investing in this new sector. The European Bank for Reconstruction and Development is said to be opening up financing programmes for SMEs in RE in Morocco and other North African countries.[71] In addition, ADEREE is currently in the process of launching an integrated programme for large-scale deployment of SWHs, called Shemsi, which aims to install 1.7 million m^2 of solar water heating by 2020 (as compared to 350,000 m^2 today), aligning financing schemes with communication, standards development and regulatory measures (ADEREE 2013). The details of this programme, however, have not been clearly communicated yet.

Further, some interviewees mentioned the importance of credit guarantees, especially for smaller projects. A well-developed system of credit guarantees exists under the aegis of the Caisse Centrale de Garantie (CCG) and has recently been augmented to provide better services to Moroccan SMEs. It constitutes a solid foundation upon which a broader credit-guarantees scheme targeting the financing of solar electricity generation plants could potentially be established. Currently, CCG works together with three venture capital funds, guaranteeing their interventions targeted at SMEs. For typical SMEs, CCG guarantees 50 per cent of the risk-capital invested,

69 Interview with Nareva Holding in Casablanca on 21 February 2013.

70 A local SME, Phototherme, claimed that 50 per cent of its financing comes from the Banque Populaire and Crédit du Maroc (interview with Phototherme in Marrakech on 20 February 2013).

71 Interview with MEMEE in Rabat on 20 February 2012.

whereas SMEs embarking on innovative projects benefit from a 60 per cent guarantee. The caveat is, however, that enterprises in the early stages of their development (such as young entrepreneurs and start-ups) are currently not eligible for the scheme.

The introduction of end-user finance programmes can potentially create opportunities for the Moroccan banking sector to create a viable business case that promotes the domestic solar energy industry at the same time. Good practices such as the Tunisian PROSOL programme (see Box 16) (UNECA 2012), the Moroccan Efficient Lighting programme and the Indian Solar Loan programme provide valuable insights into how the financial sector can be incentivised to step up and finance RE technology (UNEP 2011). As the Tunisian example shows, supporting the involvement of the banking sector in the SWHs programme has been critical (e.g. by subsidising interest rates).

Box 16: The Tunisian PROSOL programme

In 2005, the Tunisian government introduced a programme entitled "PROSOL" in an attempt to develop a sustainable market for solar water heating and displace the use of heavily subsidised LPG. Two of the key challenges at that time were widespread sluggishness of local banks to finance SWHs as well as an entrenched – and therefore difficult to change – gas subsidy regime.

By applying a sophisticated financing scheme, however, the deadlock was broken and the market took off. In order to create a level playing field, a 20 per cent capital cost subsidy for solar water heating was set by law, which resulted in an equalisation of subsidies between the new clean technology and conventional LPG. Furthermore, the government introduced a VAT exemption as well as reduced customs duties for SWHs. Once a household decided to purchase an SWH, local banks provided a five-year loan with a 10 per cent down payment that was repaid by the customer through the electricity bill. The monthly payment equalled the energy savings, thereby making the benefits of a shift towards innovative solar-thermal technology obvious to the ordinary household. Interest rates were also kept low, although average rates for conventional consumer loans amounted to 12–13 per cent at the time of PROSOL's kick-off.

The crucial factors that led to the success of this programme were: (1) the national utility's involvement in assuring banks of almost full loan performance, which induced them to lower interest rates by 5 to 6 percentage points, and (2) UNEP's involvement, by which interest rates were further lowered to zero per cent by means of interest rate subsidies. As a result, the full benefits of the new clean technology could be passed on to the customer. What followed was a surge in installations of SWHs.

Until 2010 a total of US$ 73 million in local bank loans was provided. Approximately 363,000 m^2 of solar water heating were installed, equalling 136,466 systems installed. Through the programme, the number of qualified installers increased 12-fold, from 100 to 1,200, while the number of sale companies increased 6-fold, from 8 to 50. According to UNEP, more than 3,500 direct jobs were created (UNEP 2011). Attijari Bank, the Tunisian subsidiary of the Moroccan Attijariwafa Bank, was one of the local banks that provided loans, lending approximately 64 million EUR to customers over the period from 2007 to 2011 while building up – potentially transferable – knowledge on end-user finance programmes at the same time.

Source: UNEP (2011) and ANME (2011)

7.3.2 Other domestic financial actors

Societé d'Investissement Energetiques (SIE) is the main financial institution dedicated to RE in Morocco, endowed with 1 billion MAD (about US$ 120 million) for capital participation in investment projects. SIE is currently taking a three-tier position as (1) an anchor investor, (2) a co-developer and (3) a fund-leveraging institution. Not least by setting up a new specialised investment fund, the Fonds d'Énergies Renouvelables (FER), it has shown its commitment to wind energy by creating a template that could potentially be applied to solar energy, too. In fact, the agency is currently devising plans to establish a solar investment fund that is either administered by a management company (as with FER) or by SIE itself, and that focuses on small-scale medium-voltage projects up to 20 MW. A representative of SIE stated that the fund potentially targets three types of PV deployment: (1) development of solar plants for industrial zones, (2) development of mini solar plants for zones not connected to the grid, (3) development of mini solar plants for isolated zones.[72]

Although SIE continues to be the lead actor for investments in RE in Morocco, a number of other domestic financial actors and instruments are either in place already or currently beginning operations, contributing to closing the existing financing gap. Most recently, MASEN Capital has emerged as another public actor, which calls for a clearer distribution of work as well as coordination between these two state-backed investors (SIE and MASEN Capital). In the meantime, private investors of different backgrounds (such as Caisse de Dépôt et de Gestion Capital Infrastructures (CDG) and Brookstone Partners) are preparing for greater involvement in financing RE generation projects, complementing the financing mechanisms that local banks and actors such as SIE and MASEN offer. CDG Capital Infrastructure is a management company that manages an investment fund specialised in infrastructure (50 million EUR, with a target size of 300 million EUR). Given its interest in lower-risk investments, CDG Capital Infrastructure is exploring investment opportunities for RE power plants that have a power purchase agreement.[73]

Despite these positive movements, financing options for SMEs in the domestic solar energy sector continue to be limited. Given the aforementioned actors' big investment tickets, as well as the domestic banking sector's current weakness in providing the necessary funding to smaller indigenous companies, challenges remain for Moroccan SMEs with regards to access to funding for RE-related projects. Yet, conditions are gradually improving as an – admittedly still underdeveloped – domestic venture capital market is gaining momentum. According to CCG, the number of risk-capital operations – that they participated in as a provider of guarantees – increased from two in 2010 to six in 2011 and seven in 2012.[74] A recent report by the AfDB states that the sector comprises *"about 15 companies managing 20 (13 general and 7 specialised) investment funds"* (AfDB 2011a, 9). Nonetheless, interviewees emphasised that the Moroccan risk-capital sector is still in its early stages.

72 Interview with SIE in Rabat on 5 March 2013.

73 Interview with CDG Capital Infrastructure in Casablanca on 27 March 2013.

74 Interview with CCG in Rabat on 29 March 2013.

International good practices in RE financing suggest that there is room for new financing instruments in Morocco. Given the challenges presented by investing in RE, what is most needed is long-term capital that breaks the deadlock and kick-starts an upward spiral. Experts emphasise the necessity of *"'patient capital', which is relatively hard to obtain, given typical short-term horizons of private capital markets"* (Griffith-Jones / Ocampo / Spratt 2012, 28). Recently, suggestions have been made that instruments such as green bonds (Griffith-Jones / Ocampo / Spratt 2012, 28) or a national RE investment bank (see Box 17) could provide this form of capital and potentially close the funding gap (Milford / Tyler / Morey 2011). The necessary condition, however, is that the domestic market for solar energy grows and the number of projects increases.

Box 17: The United Kingdom's Green Investment Bank

In May 2012, the UK took an unprecedented step by setting up the world's first investment bank solely dedicated to greening the economy. The new Green Investment Bank (GIB), which is capitalised with 3 billion GBP from the government, *"will play a vital role in addressing market failures affecting green infrastructure projects in order to stimulate a step up in private investment"* (BIS 2013).

GIB's founding followed the UK government's realisation that an estimated minimum of 200 billion GBP is needed in order to green Britain's energy system, deliver sustainable, low-carbon economic growth on a long-term basis and meet its RE and climate change targets before 2020. By establishing a specialised investment bank, the UK is trying to tackle two of the key problems that usually hinder broader RE deployment: (1) the limited availability of reasonably priced capital and (2) the stretched balance sheets of major utilities. GIB therefore is trying to thwart the risk of an almost inevitable funding gap that will evolve due to the magnitude and timing of the investment needed for RE, on the one hand, and the limited ability of the traditional financial sector to provide this funding, on the other (SSE 2013).

GIB was not introduced on an isolated basis but was rather accompanied by a number of key policies, including a National Infrastructure Plan, several electricity market reforms, realignments of the climate-change levy and new incentives targeting renewable heat (BIS 2013).

7.3.3 Bi- and multilateral development banks

Bilateral and multilateral development banks play an important role in supporting the government's reform efforts to develop the Moroccan financial sector and to support the development of the RE sector. For many years, the AfDB, for instance, has supported Morocco *"to strengthen governance and deepen the financial sector by diversifying instruments to improve access by the population and enterprises to financial services"* through its Programmes d'Adjustement du Secteur Financier I to IV and more recently through the Programme d'Appui au Développement du Secteur Financier from 2009 to 2011. Furthermore, the World Bank continuously assists Morocco by providing technical assistance as well as by channelling funds from the Clean Technology Fund (CTF).

Moreover, development banks prove to be indispensable providers of critical funding for RE power plants in the country. Various actors – among them the World Bank's International Bank for Reconstruction and Development, AfDB, EIB, AFD and KfW – provided funding for the first Moroccan solar-based electricity plants in Ain Beni Matar and Ouarzazate, creating visibility and market momentum for the development of this sector. Still, the adequate design of future technical assistance programmes and timely funding schemes targeting specifically solar energy deployment is a continuous challenge. Working towards the greater involvement of domestic private financial actors in the future, and thus performing a gradual shift in influence, should rank high among development banks' priorities. One channel through which development banks can support the local banking sector is by providing guarantees for private investors (instead of only credit lines). Technical cooperation can also assist with improving the bankability of projects.

7.3.4 Policy recommendations

- Encourage domestic banks to introduce further RE credit lines.
- Assist the banking sector in building up expertise in RE financing and project financing by encouraging cooperation with foreign banks as well as technical assistance by multilateral/bilateral development banks (to improve projects' bankability).
- Create a domestic venture capital market.
- Intensify cooperation with development banks to provide guarantees for private investors.
- Assess opportunities offered by new financing instruments such as green bonds or a national RE development bank.

8 Fostering business linkages

The previous chapters stressed that mobilising private investment of foreign and domestic origin and enhancing technological capabilities represent necessary conditions for the creation of business linkages that facilitate technology transfer. Given that technological capabilities in the emerging Moroccan solar energy sector are currently relatively limited (see Chapter 4), private sector investment and technology transfer are vital. However, the benefits from these processes in the form of higher levels of competitiveness do not materialise automatically. Rather, a targeted approach to building linkages between leading firms and domestic companies is necessary.

In recognition of the importance of business linkages, various stakeholders concerned with industrial development in Morocco have been tasked with facilitating the process of cooperation between local and foreign companies. Following a brief discussion on the importance of business linkages for technology transfer and competitiveness, we shed light on the main organisations and programmes responsible for these activities in Morocco. In doing so, we emphasise how these efforts should be further steered towards the needs of the emerging solar energy sector. In addition, we point to domestic and international good practices for business linkages and discuss various mechanisms for technology- and knowledge transfer. Lastly, we propose several recommendations for more targeted support measures.

8.1 The importance of business linkages for competitiveness

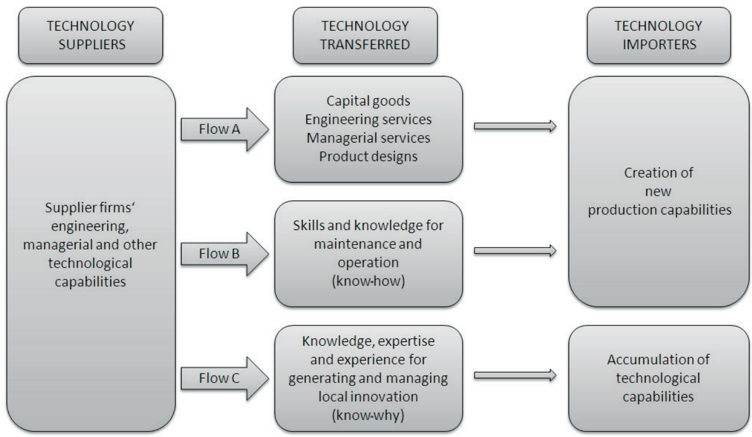
As the experience of other countries shows, competitiveness depends to a great extent on the ability of firms to tap international sources of knowledge as well as to absorb and use that knowledge efficiently (Altenburg 2005). These critical resources of knowledge include managerial skills as well as financial and technological know-how. One of the best ways for local SMEs to access those resources and produce higher value-added goods and services is through business linkages[75] with TNCs that lead to technology transfer (Altenburg 2005; UNCTAD 2000). In their cooperation with SMEs, TNCs tend to define product and process standards along the supply chain, thus forcing their local partners/suppliers to upgrade their industrial performance (Altenburg 2005, 5). Moreover, TNCs have easier access to international best practices, leading markets and new technologies, and they can act as gatekeepers to markets. Local SMEs, however, can provide contacts to local customers and decision-makers, having a more complete knowledge of the local market (Altenburg 2000, 2005). The large-scale production capabilities of TNCs, coupled with the flexibility and specialisation of SMEs, allows for successful technology transfer through spillover and trickle-down effects, leading to win-win outcomes. Ultimately, in this process, spillover effects are expanded and have positive impacts on employment and technological upgrading – a critical pre-condition for achieving inclusive competitiveness.

Technology transfer can happen in various ways, and thus has different outcomes (see Figure 13). Transferring physical equipment (Flow A) is the most common mode of transfer, whereas the transfer of knowledge

75 There are mainly four types of business linkages of TNCs with local partners: backward linkages with suppliers; linkages with technology partners; forward linkages with customers; and other spillover effects (UNCTAD 2010, 16). Backward linkages form when TNCs draw on local suppliers for services, materials, parts or components. Linkages with technology partners occur when a TNC engages in licensing agreements, joint ventures or strategic alliances with local companies (UNCTAD 2010, 16). This can occur either because the partners anticipate mutual benefits from such joint projects and governments remove obstacles for such projects or because specific domestic ownership requirements induce TNCs to engage with local partners. Forward linkages with customers are formed when TNCs producing certain inputs offer after-sale services to industrial buyers or in case they source out the distribution of their brand name products through marketing outlets. Other spillover effects refer to human capital through training provided by a TNC and demonstration effects (UNCTAD 2000, 4ff.; UNCTAD 2010, 16).

and skills (Flow B) is, in turn, more complex, but it allows the recipient to absorb the necessary skills to understand and use the technology. Both lead to the creation of new production capacities for the SMEs that receive the knowledge and/or technology. The "know why" (Flow C) represents the most effective way to accumulate technological capabilities. It includes not only technology and knowledge, but also experience for creating and managing local innovation by understanding the underlying processes and strategies (Ockwell et al. 2010b). However, only few TNCs are willing to allow such deep insights into their processes, knowledge and experiences. It is therefore crucial for SMEs to acquire as much knowledge as possible – if not openly and directly from the respective TNC, then at least by working closely together and gaining insights by learning about processes.

Figure 13: Flows of technology transfer



Source: Based on Bell (1990) and Ockwell et al. (2010a)

8.2 Existing programmes for facilitating business linkages in Morocco

During the fieldwork, it became clear that there is little awareness about the necessity for business linkages among the Moroccan companies companies we interviewed, even though official programmes to support these linkages exist. There is also sparse experience with business linkages and only a few arrangements in the solar sector exist in the form of joint ventures. The few examples of partnership found were mainly foreign TNCs that set up subsidiaries in Morocco, which became independent later on but still have close connections to their parent companies. Most SMEs do not have a partner or the desire to cooperate with a TNC. However, when asked, the idea of technology and know-how transfer was viewed as being crucial for the development of the sector. Therefore, an assessment of existing services to support business linkages is needed that is driven by a targeted approach to fostering technology transfer for enhancing competitiveness in the emerging sector.

The entity with the most direct mandate of facilitating business linkages (e.g. matchmaking) between foreign companies and SMEs in Morocco is the Bourse Nationale de Sous-traitance et de Partenariat (BNSTP) within MCINET. Though the activities of BNSTP are officially all-encompassing, discussions with private sector representatives and government officials suggest that the agency has not been highly successful in providing and promoting effective business partnerships. The main problems are the small size of BNSTP (four employees); the fact that they are widely unknown among local and foreign companies, partly due to a malfunctioning homepage and the lack of clarity regarding their role in relation to CRIs and AMDI; and its limited direct engagement with local and foreign enterprises. This leads to the problem that the services of BNSTP are not geared towards a strategic linking process, but are rather provided *ad hoc*. Further issues are the insufficient database, which mainly focuses on companies in Casablanca and Rabat. When asked by foreign companies for subcontractors for the manufacturing of the CSP plant in Ouarzazate, they are forced to rely on the local Chamber of Commerce for contacts to local companies.[76] The lacking cooperation and exchange with the Chamber of Commerce, CRIs and AMDI makes it difficult to provide strategic support to companies. Another emerging issue is their low level of knowledge about the existing companies in the solar sector and their fields of business and expertise. Since the sector is developing, only a few companies are registered in the database, and it is often unclear what specific products or services they are able to offer. Some of these shortfalls in their services relate also to the financial challenges that BNSTP faces.[77] Currently, services for networking, organising and bench-

76 Interview with BNSTP in Casablanca on 19 March 2013.

77 Interview with MCINET in Rabat on 26 February 2013.

marking are being supported by UNIDO, but BNSTP has not been effective in self-sustaining its activities. Hence, a complete re-evaluation and restructuring of its services is necessary. One good-practice example to look at and learn from is Ireland with its successful linking agency (see Box 18).

Box 18: Successful business linkages in Ireland – The National Linkage Programme

Ireland focused largely on targeted FDI and incentivising business linkages throughout its industrial development in the 1980s (Sanchez-Ancochea 2009). An institutional framework, tailored government interventions and a strategic industrial policy were essential for upgrading and increasing competitiveness. By picking certain industries and specific firms, Ireland gave grants and tax incentives to joint-venture projects that conditionally adopted programmes to strengthen marketing, management and production capabilities.

Still today, the National Linkage Programme is responsible for identifying opportunities for business linkages with TNCs and assesses potential partners and suppliers. This is done through matchmaking processes that combine a TNC's sourcing requirements with production profiles of local suppliers. In the beginning, it was targeted at the electronics sector, but expanded later to other sectors. The National Linkage Programme works with both TNCs and SMEs. Together with more than 250 TNCs, new business opportunities for local suppliers were identified and technology and business trends were monitored.

Aside from seminars and studies, the National Linkage Programme also introduced criteria for successful supplier relationships (e.g. quality, cost and service). In cooperation with supplier companies, developments in management and control, quality standards, finance and marketing were targeted and worked on. Through the National Linkage Programme, local SMEs became suppliers to TNCs such as IBM, Apple and Dell (UNCTAD 2006). Another institution is geared towards the funding requirements of Irish companies: Enterprise Ireland offers support to businesses tailored to their respective development stage.

The funding services range from regular start-ups to high-potential start-ups, and from SMEs to large companies that desire to expand internationally (Enterprise Ireland 2013).

Other agencies that play such a role in Morocco, but rather indirectly, are AMISOLE, CGEM as well as CRIs.[78] AMISOLE is part of FENELEC, the National Federation of Electricity and Electronics, which is the industry association for the electricity and electronics enterprises in Morocco, active in promoting the commercial interests of firms to policy-makers. AMISOLE represents the companies in the renewable energy sector and has currently 59 companies as members (FENELEC 2012), providing valuable information about the various companies. CGEM has recently created a committee that engages in strengthening business linkages and is currently working on a new model for linkages between SMEs and foreign firms, which is to be tested in some companies in different industrial sectors. However, this committee is too novel to assess its effectiveness. The mission of CRIs is to assist foreign investors with setting up their business operations in different regions of Morocco and mainly focus on support with respect to services and infrastructure needs. However, none of these institutions are specifically tasked with creating business linkages; they mainly serve as information brokers and lobbyists, and they offer a starting point for new companies in the field.

Hence, with all the various actors in place, it is necessary to evaluate their activities, create synergies and define the different roles they can play in the process of facilitating business linkages.

8.3 Domestic experience with business linkages

Business partnerships / joint ventures, firm-level training programmes, licensing of technology and supplier development programmes are among the most successful mechanisms to transfer technology and know-how between enterprises. Local content requirements[79] (LCRs) have often been used to support the transfer of know-how, although evidence shows mixed

78 Development cooperation actors, such as the AfDB and GIZ also play a role in fostering North-South (and South-South) technology transfer. GIZ acts as a facilitator for business linkages through the organisation of trade fairs and the current cluster initiative with MASEN, where they bring together companies from the EU and Morocco.

79 The WTO defines local content requirements as follows: *"Requirement that the investor purchase a certain amount of local materials for incorporation in the investor's product"* (WTO 2013).

results regarding the enhancement of technological capabilities.[80] Below we discuss how these mechanisms for business linkages that are geared towards technology transfer have materialised in the current context of industrial development in Morocco, and we highlight, where possible, how good practices can be used to enhance learning opportunities.

8.3.1 Business partnerships / joint ventures

Experience with development policy suggests that joint ventures are among the most effective mechanisms for technology transfer in developing countries. Research has shown further that mandatory joint ventures are not beneficial in this regard; rather, policy-makers should promote and incentivise voluntary joint ventures. If TNCs are forced to take on local partners and they are not entirely interested in a partnership, the company usually finds ways to avoid technology- and know-how transfer (Altenburg 2000, 45). In order for joint ventures to be successful, legal as well as policy measures play an important role too. Even though technology transfer most commonly occurs through the private sector, an "enabling" environment is needed for creating the conducive context in which joint ventures can develop.

A good-practice example is Turkey's policy on facilitating joint ventures (see Box 19). Such an environment can be created by removing any possible legal and policy barriers as well as establishing advantageous incentives. Possible barriers can be overemphasised standards and certifications as well as overtaxation. Furthermore, for achieving a successful joint venture, companies need to analyse what value added they are able to achieve in the supply chain of a solar project and how to reach this by partnering with another company. A Moroccan SME active in the RE sector underlined this point clearly: *"We don't know the whole picture, only big companies do. So they can tell us what small thing we can do and we start developing."*[81]

However, based on our interviews with various companies we found that joint ventures in the solar sector in Morocco are currently almost inexist-

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80 Financing institutions, such as banks or donors, as well as the contractors are increasingly concerned with efficiency and low risk in the short term, and hence rely on existing capabilities in the construction and management services sectors instead of developing capabilities in high value-added components manufacturing or engineering (Bell 2007).

81 Interview with a private company in Berrechida on 11 March 2013.

ent. One of the few examples is the Compagnie Marocaine des Energies (CME), a Moroccan SME developed as a joint venture between two Belgian companies active in the RE sector. CME works on wind and solar energy and exchanges mainly information about the different project implementation strategies as well as operational and logistical issues with their Belgian partners.

Instead, the current practice in Morocco is to develop business partnerships in consortium with various foreign companies on tender-based projects. Such partnerships are more common in the wind energy sector. A good-practice example from the wind energy sector is Nareva Holding. The company has developed partnerships with several international players, such as GDF Suez Energy International, Mitsui, TAQA and Enel Green Power. By assessing the possible complementary capabilities and available technologies, Nareva Holding strategically selects their partner for different projects, aiming at learning along the entire value chain. Hence, Nareva Holding pursues the complete joint development in every phase of the project with different working groups, such as for legal, fiscal and technological areas. With a focus on large-scale projects, Nareva Holding is further pursuing the localisation of various manufacturing processes in Morocco and thus maximising local value added.[82]

Some of the challenges to building partnerships in the emerging solar energy sector relate to limited market predictability (see Chapter 6), highly bureaucratic procedures, and the lack of strong local companies and compatible capabilities in the sector. Many of the foreign companies manufacturing solar energy components in Morocco are currently not attractive due to the small market (see Chapters 6 and 7), whereas exporting solar technology to Morocco is regarded as a more cost-effective alternative. It is therefore important that Moroccan companies are structurally integrated in the value chain (e.g. metal structures, electrical components and other niche activities in the solar sector that are compatible with the activities of foreign companies and the domestic comparative advantage) and that their technological capabilities are upgraded (see Chapter 5).

82 Interview with Nareva Holding in Casablanca on 21 February 2013.

Box 19: Turkey – Ensuring technology transfer through joint ventures

Turkey is a good-practice example when it comes to business partnerships in the RE sector. The ambitious aim to generate 30 per cent of its power from renewables by 2030 and to develop 600 MW in photovoltaic capacity by 2015 prove this. Similar to Morocco, Turkey has a strategic geopolitical location between Europe and Asia, and the opportunities for technology transfer are high. Incentives are also given, particularly to solar and wind power.

A FIT for renewables and an additional payment for locally produced equipment lures many investors to Turkey. The Turkish Energy Ministry is even looking for more local content incentives to attract investment and push local production (Nicola / Parkin 2013).

To further build up production capabilities for solar PV, Turkey fosters technology transfer by promoting joint ventures in the solar energy sector, aimed at enabling it to supply the emerging regional market (ISPAT 2013). The Chinese solar cell and module manufacturer China Sunergy, and the Turkish solar system provider and project developer Seul Energy Investment have set up a solar cells and modules manufacturing plant in Turkey. This joint venture creates not only 1,200 new jobs, but also supports Turkey's efforts to become competitive in the solar energy sector. German companies are also interested in investing in manufacturing plants in Turkey, as the recent example of Nordex Enerji A.S. Vexco GmbH shows.

Through the Turkish unit of the clean-energy developer, broker and financial adviser, several German SMEs plan on investing in solar manufacturing plants, fuelled by high prices in the power market, electricity and economic growth (Nicola / Parkin 2013).

8.3.2 Inter-company training

A successful mechanism to maximise the transfer of technology and know-how is through inter-company training measures. TNCs often not only provide their partner with the necessary administrative skills, but also conduct training on different technologies and operational know-how. These training measures require specific investments and do not happen "automatically"

(Bell 2007). Hence, targeted funds or grants need to serve as incentives for companies to strengthen this mechanism of technology transfer. Regarding larger infrastructure projects, such as the CSP plant in Ouarzazate, training activities have to be specifically targeted towards building more knowledge-intensive domestic capabilities. The training should focus on the specific requirements related to designing and engineering large plants as well as on the operation and maintenance of the facility that is being constructed (Bell 2007).

Various Moroccan companies in the solar energy sector mentioned that they already benefit from inter-company training measures. AE Photonics trains their staff with engineers from Lorentz – a German SWP manufacturer that supplies its product to AE Photonics – both with respect to theoretical knowledge and practical applications. Qualified employees also participate in "train the trainer" activities in Germany so that they can spread the acquired knowledge to other employees in Morocco.[83] Another example is a major electrical equipment manufacturer that provides training for 100 local SMEs on various products. Employees are also sent to France for training and hands-on learning in manufacturing plants. The company also works with a Moroccan electrical engineering school and has its own "learning room" in its manufacturing facility in Casablanca.[84] In addition, the company CME sends new employees to its Belgian partner for technological on-the-job training and learning of the underlying processes of the company's operations. This type of training is especially useful for acquiring know-how, since it goes beyond technology transfer towards real transfer of expertise and experience, as described in Flow C (see Figure 13), and enables the company to generate and manage their own innovations later on.[85] Another successful example is a larger Moroccan SME that acts as a project developer in the solar energy sector and receives operational training measures from its parent company, not only about the technology but also the standards for installations. Their training programmes are so successful that they are now extending the training on ICT to other Arabic-speaking countries such as Libya, Jordan and Senegal. For acquiring knowledge on new products, the parent company gives specific training on the products and their installation as well.

83 Interview with AE Photonics in Casablanca on 25 February 2013.

84 Interview with a large company in Casablanca on 12 March 2013.

85 Interview with CME in Rabat on 12 March 2013.

Such inter-company training is very successful in transferring knowledge about both administrative and technological capabilities and should be standardised when joint ventures and business partnerships are created. Ultimately, benefits accrue also to foreign firms, given that they gain insights into how projects in Morocco are implemented, what knowledge needs to be adapted to the local context, who the key players are and how the local market functions.

8.3.3 Technology licensing

Technology licensing is another mechanism that allows for technology transfer. The transfer is possible by using a technology or product that comes from abroad and for which the customer owns the intellectual property rights (IPRs); the manufacturing or assembling is then carried out locally. The example of South Korea (see Box 20) demonstrates that this mechanism can be successful – if, at the same time, there is investment in local capabilities.

Box 20: Technology licensing in South Korea's semiconductor industry

South Korean business conglomerates, such as Samsung for their semiconductor business, have successfully used technology licensing as a tool to enhance their technological capabilities. The IPRs belonged to the customer in the United States, but with further investment in R&D and the help of qualified personnel recruited from abroad, Samsung was able to innovate and commercialise its own innovations based on the existing IPRs. This was mainly due to the efforts of the South Korean government to focus on R&D to support the technology licensing mechanism for technology transfer. The private sector in South Korea also invested billions of US$ into R&D – leading to one of the highest levels of investment in R&D worldwide.

Science and engineering research centres were set up in leading universities, and governmental research institutes supplemented the necessary research to enhance technological know-how. One of the projects, for example, is the HAN project, which aims at having South Korea reach the technological capability level of the G7 states by 2020. The private sector paid for half of the investment and was deeply engaged in the research on semiconductors. Lastly, many companies strategically reached out to Korean-Americans with know-how in the field and incentivised them with attractive compensation and the possibility to conduct research independently.

The combination of technology licensing and investment in R&D spurred technological learning and innovation in the semiconductor industry and thus allowed South Korea to leapfrog in this industry and catch up with leading companies.

Source: Kim (2000)

The two examples of effective technology licensing practices in Morocco are Valtronic and a major electrical equipment manufacturer. Valtronic uses the intellectual property of the client to manufacture their products and simultaneously learns throughout the process of manufacturing it.[86] Another major electrical equipment manufacturer produces power substations in Morocco through technology licensing, and hence provides the manufacturing company with technological know-how.

Even though this mechanism is very successful in transferring knowledge, there are also several challenges. Foreign enterprises are oftentimes reluctant to provide their core technologies to other companies and have strict IPRs on their products to limit competition, especially in the RE sector (Bell 2007; Hanni et al. 2011). Where this is the case, Moroccan companies should then focus on acquiring management and process knowledge as well as design and engineering capabilities that are up to international standards.

8.3.4 Supplier development programmes

Literature and international experiences suggest that supplier development programmes, aimed at upgrading local companies, have to be driven by the (foreign) technological leader for them to have positive spillover effects. Obligations to support suppliers, or the pre-selection of suppliers, have often not led to substantial supplier development. Although the leading company

86 Interview with Valtronic in Casablanca on 11 March 2013.

should be able to select its own partners and to design adequate supplier development programmes on its own, the government can act as a facilitator by increasing the capabilities of firms (through upgrading programmes, education, training and R&D) (see Chapter 5) upon which leading firms then can build technology-specific programmes. In terms of incentives for supplier development, the literature suggests that grants or funds should be linked to specific performance requirements of the respective supplier to ensure positive spillover effects (Lall 2003).

In our interviews, no government programme was mentioned that offers incentives or support that is specifically targeted to supplier development. With respect to in-house training of suppliers, companies were either not aware of financial-support schemes or considered them too complicated in terms of procedures. Some good practices were found among TNCs in other sectors in Morocco, showing how supplier development programmes can be beneficial for the local industry. However, the companies that established successful supplier development programmes are predominantly TNCs that have access to international networks, resources and experience. Hence, learning from these experiences cannot be easily transferred to local SMEs. However, policy-makers can capitalise on the presence of these companies in Morocco by creating learning platforms where some of these experiences can be made more visible (e.g. workshops, seminars).

In particular, Alstom – a transport infrastructure, power generation and electrical grid company – has a two-tier strategy for supplier development.[87] On the one hand, Alstom incentivises its European suppliers to locate in Morocco by giving them visibility in the country and buying from them for a guaranteed period of three years or more, depending on the sourced commodity. This has been successful in six or seven cases. On the other hand, a specialised division targets Moroccan companies by identifying potential suppliers and auditing them. Based on this audit, it develops programmes to improve quality standards and processes. This example underlines again the importance for local companies to have certain basic standards and processes in place in order to be considered as potential suppliers and to benefit from more specific supplier development programmes with respect to particular technologies.

87 Interview with Alstom in Casablanca on 12 March 2013.

Another good-practice example from the automotive sector is Leoni, a cable company, and its supplier development activities.[88] Besides Leoni's philosophy of employing Moroccan personnel up to the highest positions and strong training efforts through foreign experts, the company is particularly active in developing local suppliers. Finding suitable suppliers happens in one of the following ways: firstly, Leoni already knows potential suppliers (that are either already active in the field or can easily adapt to a similar field); secondly, the client recommends suppliers they have experience with; or thirdly, Leoni organises public tenders for suppliers. The public tenders for suppliers serve as a test of their competitiveness. Before contracts are signed, all suppliers have to undergo quality-standard audits conducted by Leoni and the client. Once both sides sign a two- or three-year contract, the suppliers are preferably located close to the respective Leoni facility and are guaranteed to be able to supply a certain volume. They furthermore receive support in infrastructure matters, for example through donated storage space and start-up support if the supplier is new in the field or location. Setting up new supplier bases, and hence outsourcing certain processes, has allowed Leoni to profit from reduced costs and greater flexibility through prompt delivery and availability of specific products that are not in stock.

8.3.5 Local content requirements

Although controversial, LCRs can, under certain conditions, be an effective mechanism for the development of competitive industries through business linkages and subsequent technology spillovers (Kuntze / Moerenhout 2012, 1). LCRs aim at ensuring benefits to the economy by protecting the local industry and requiring TNCs to manufacture locally. They are particularly controversial considering the implications for the investors: if local manufacturers or suppliers lack the capabilities and are not competitive in the global market, investors are burdened with higher costs, lower quality and/or slower production (Johnson 2013). As discussed in Box 21, LCRs for PV manufacturing in India failed to establish a local production base and even had the opposite effect.

88 Phone interview with Leoni on 12 April 2013.

Box 21: Local content requirements for PV manufacturing in India

When the Indian government announced the Jawaharlal Nehru National Solar Mission in November 2009, the goal was not only to deploy 20 GW of solar energy, but also to emerge as a global leader in PV manufacturing. More than 85 Indian companies were active in cell and module manufacturing and assembly, and the overall capacity was at 700 MW when the National Solar Mission was launched. The government set up a committee tasked to identify potential manufacturing components and establish LCRs to promote local manufacturing of crystalline silicon PV modules – thin-film and concentrated PV modules were still allowed to be imported.

The World Bank and even local companies voiced their concerns over this strict implementation of LCRs and advised to first develop further capabilities and then start local production in a second phase. Nevertheless, the Indian government forced the LCRs, which resulted in a massive import of thin-film modules. Locally-manufactured c-Si modules lost their competitiveness and foreign companies turned away from India. Local companies thus faced serious problems and had to lay off workers.

The explanations for the failure of LCRs in India are manifold: among the main reasons were that the market's size and stability were weak in India, in addition to the high level and strict implementation of LCRs. There was also no policy support for local manufacturers to assist them in upgrading their capabilities and adapt to the newest technologies. Lastly, the strict choice of c-Si technology did not offer the right incentives to investors and even contributed to a rise in thin-film modules.

All the stakeholders involved should have been consulted before setting the LCRs, and an evaluation process of the effectiveness of the LCRs should have been set up early on. In the future, the choice of the technology as well as the strictness of the LCR implementation needed careful consideration in order to be effective. Support mechanisms for local companies are also crucial to build on capabilities, and there is a need to consult them on what components can be manufactured locally. Finally, business linkages and training measures can benefit local manufacturers in developing capabilities and integrating faster and more successfully in the value chain.

Source: Johnson (2013)

Morocco has not signed the WTO plurilateral Agreement on Government Procurement from 1994/1996 and thus mandatory LCRs are not generally prohibited. However, it is unclear how much leverage Morocco has with respect to applying such mechanisms, especially for projects that benefit from multilateral financial institutions, such as the World Bank and the EIB, that clearly prohibit their use. However, the country has already used LCRs by including them on a voluntary basis in public tenders, for example for the first phase of the Ouarzazate solar plant. MCINET is furthermore developing a mechanism called *"taux du compensation industrielle",* which would require companies (initially on a voluntary basis) investing more than 20 million MAD to spend 50 per cent locally. So far, Alstom has complied with this programme on a voluntary basis but mentioned problems in fulfilling the 50 per cent due to a lack of qualified suppliers.

Nevertheless, it became obvious in the interviews with professionals in the private sector that the 30 per cent target for local content in the first phase of the Ouarzazate solar plant will be achieved by sourcing only from areas in which Morocco already has capabilities (e.g. civil works, steel structures) but with low value-creation potential. Hence, the local content that will be created will not lead towards creating significant technological capabilities. Several private sector interviewees favoured more rigid LCRs and suggested that local content should be considered as equally important in public tenders as the project costs: *"The criteria for future tenders should be wisely evaluated so that the most credible and most trustworthy offers win. This would not mean the cheapest, but the 'best' offer which can only be provided by a company which (1) has experience, (2) knows the Moroccan market and (3) is credible"*, explained a large electricity infrastructure company. Yet, LCRs that are too rigid are likely to scare away potential investors and could violate WTO regulations. LCRs have thus to be implemented with great care in a way that the benefits for all actors involved outweigh the costs of such measures (Kuntze / Moerenhout 2012, 7).

Literature suggests that in order to safeguard the benefits of LCRs, certain conditions have to be in place. First, a sizeable and stable market is needed in order to stimulate demand. Otherwise, the higher costs resulting from LCRs might put off potential investors (see Chapter 7). Second, it is important to determine the level of local content in close consultation with all stakeholders in order to learn what rate of local content can be fulfilled while maintaining the necessary quality (Kuntze / Moerenhout 2012, 8). It is furthermore important that the level of LCRs increases in line with the development of the local industry, and that it is phased out at the point where the industry has developed competitiveness and no longer depends on LCRs as support measures. Otherwise, there is no incentive for local companies to take advantage of the protective space to build competitiveness after the LCR phase-out. Third, governments have to prepare the local industry up front for LCRs through subsidies or other incentives (see Chapter 6 and Veloso (2001)). Fourth, technological learning effects can only result from LCRs if the knowledge gap between foreign and local companies is not too wide; therefore, the acquisition of technological capabilities (through enhancing education and research programmes and industrial upgrading) is important. Otherwise, it is unlikely that employment effects and technology transfer will materialise. Thus, measures of industrial upgrading and technology transfer discussed above have to go hand in hand with LCRs.

8.4 Policy recommendations

- Assess, target and coordinate programmes and databases more efficiently to facilitate, create and support business linkages in line with the strategic direction for industrial development and geared towards transferring technology and know-how; especially in regard to the Chamber of Commerce, CRIs, AMDI and BNSTP;
- Choose an institution (the Chamber of Commerce, CRIs, AMDI or BNSTP) that takes the leading role in coordinating the different institutions and creates synergies among them.
- Re-evaluate and restructure BNSTP's services with respect to matchmaking and facilitating joint ventures between foreign and local companies. The services should include the following:
  - Work together with TNCs to identify new business opportunities for local suppliers.
  - Provide seminars and studies for successful supplier relationships (e.g. quality, cost and service) for both TNCs and SMEs.
  - Work on management and control, quality standards, finance and marketing in cooperation with supplier companies with the knowledge brought from TNCs.

- Systematically analyse the manufacturing potential of SMEs in niche activities in the solar sector (e.g. storage options, project development) and align their potential with the activities of foreign companies.
- Require inter-company training for both administrative and technological capabilities when joint ventures and business partnerships are created, by promoting cost-sharing mechanisms.
- Gear industrial upgrading programmes towards the creation of business linkages by guiding them to the necessary investments based on upcoming projects.
- Steer foreign investors towards working with suppliers by incentivising them and allow for easier searches through improved services.
- Set up learning platforms for both foreign and domestic firms on supplier development programmes and companies' experiences.
- Increase and phase-out LCRs over time, to incentivise TNCs to source locally, but also reduce the protectionist measures early enough to allow for building self-sustaining industries.
- Decrease the knowledge gap between international and local companies in order to benefit from voluntary LCRs in terms of value added and technology transfer.

9 Towards an integrated strategy for industrial development

All the aforementioned findings have pointed to the need for a comprehensive national strategy for the development of the Moroccan solar energy sector. Without such a strategy to target both the development of a sizable local market for solar energy and the development of a local industry, stakeholders (e.g. public research institutions, enterprises, private investors, financiers) do not receive the necessary signals to engage – on a systematic basis – in the emerging sector. This then results in fragmented and disconnected initiatives, which in the long term precludes competitiveness and high local value-creation.

The Moroccan government issued the National Energy Strategy in 2008, which included both concrete short-term and long-term energy targets for the deployment of RE technologies. Building on this National Energy Strategy, Plan Solaire was launched in 2009 while different institutions in the field of RE were created. However, a concrete and integrated strategy (a road map) for industrial development in the realm of the solar industry (as issued for various other industrial sectors with Le Pacte) is still lacking. This aspect was extensively reiterated by various stakeholders during the course of our interviews.

Yet, the development of the renewable energy sector (and solar energy in particular) affects multiple government agencies and levels of government,[89] as well as non-governmental stakeholders (i.e. private sector, academia and research, civil society). Hence, this calls for coordinating industrial development objectives through multi-stakeholder governance. A good way to manage this coordination is to establish a high-level, multi-stakeholder body to "own" the solar industry development strategy,[90] set objectives, coordinate policy implementation and manage its continuous improvement (OECD 2013b, 96).

This chapter is divided into two main parts. In Section 9.1, we elaborate on theoretical considerations with regards to the process of building a national strategy. Here, we discuss different approaches that can constitute useful tools in such a process. In Section 9.2, we discuss our empirical findings and highlight the most prominent constraints related to the lack of an integrated development strategy in Morocco. Based on these findings, we discuss a preferred approach for elaborating such a strategy – multi-sector partnerships – which builds on the strengths of the various tools presented in Section 9.1. Finally, we propose the creation of an entity in charge of overseeing the implementation of an integrated strategy for the solar energy sector, the Moroccan Solar Energy Council, and conclude the chapter with policy recommendations.

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89 For instance, industrial policy geared towards renewable energy sectors has to be elaborated and implemented in combination with policies targeted towards deploying and developing renewable energy technologies.

90 In this report, our focus is the solar energy sector. Hence, the recommendations regarding strategy development and implementation are geared towards this sector. However, we recognise that the wind sector is also lacking from such an integrated industrial development strategy and that several similarities exist between the two sectors. For these reasons, policy-makers in Morocco could consider the elaboration of a renewable energy strategy that combines relevant recommendations for the solar and wind energy sectors.

9.1 Identifying binding constraints and building a national strategy

Any underperformance in growth in an economy is due to imperfections and distortions that may either be government-imposed or inherent to certain markets (Hausmann / Rodrik / Velasco 2005, 3). Furthermore, any growth strategy, while building on general principles such as the rule of law and property rights, will be dependent on the context and specificities of the country. Especially in developing countries, governments face administrative and political limitations. Therefore, neither wholesale reform approaches nor laundry-list approaches to reform are feasible. A more suitable strategy would rather be to identify the most binding constraints for economic growth and the development of a specific industry. This would allow for the development of respective policies that target these binding constraints because their alleviation would produce *"the biggest bang for the reform buck"* (Hausmann / Rodrik / Velasco 2005, 7).

As emphasised in our analytical framework, an integrated strategy for developing the solar energy sector in Morocco through strategic policy coordination is critical, and hence an important component of our study. Different approaches for identifying binding constraints can be found in the literature. These include the growth diagnostics framework, the framework for growth identification and facilitation, value chain approaches, technology foresight activities and multi-sector partnerships. None of these approaches is all-encompassing, and some remain somewhat imprecise with regards to their implementation in practice. Still, each approach offers valuable elements that policy-makers should consider during a process of strategic policy coordination. We therefore propose a process of strategy-building that relies on the strengths of multi-sector partnerships but at the same time includes relevant instruments from the other four approaches.

9.1.1 The growth diagnostics framework

To identify the most binding constraints, Hausmann, Rodrik and Velasco (2005) developed a framework for growth diagnostics that can be conceptualised as a decision tree. Economic growth depends on the return to accumulation, private appropriability and on the cost of financing accumulation, therefore *"the first stage of the diagnostic analysis aims to uncover which of* *these three factors pose the greatest impediment to higher growth"* (Hausmann / Rodrik / Velasco 2005, 7). The next stage is then to uncover the specific distortions behind the most severe of these constraints. As a result, possible remedies targeted closely at these constraints can be designed. As Hausmann, Rodrik and Velasco (2005, 9) emphasise, *"the challenge is to identify the one* [constraint] *that provides the largest positive direct effect, so that even after taking into account second-best interactions and indirect effects, the net impact of a policy change is beneficial."*

The approach has been widely discussed in the literature and was extended by Hausmann, Klinger and Wagner (2008) in their "Mindbook" on growth diagnostics. Here, Hausmann, Klinger and Wagner (2008, 32ff.) first posit four general properties that a constraint should exhibit in order to qualify as binding: first, the shadow price of a constraint should be high, which indicates that relieving this constraint would have a large impact; second, movements in the constraint should produce significant movements in the objective functions (such as growth, investment or job creation); third, agents in the economy should attempt to overcome the constraint; and fourth, agents less impacted by that constraint should be more likely to survive and thrive.

After having identified these principles, the authors further elaborate on how to set up a growth diagnostics exercise in practice. Here, they propose to follow a five-step process, which includes the following:

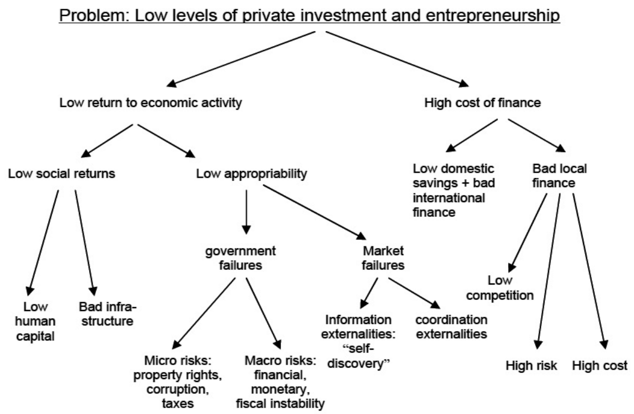
1. *"describe the growth process and determine a relevant question,*
2. *go through a differential diagnosis,*
3. *posit a syndrome,*
4. *test further implications, corroborate evidence of the syndrome, and*
5. *iterate on (3) and (4) until you converge"* (Hausmann / Klinger / Wagner 2008, 49).

The goal of the first point is to develop a clear understanding of a country's growth history and, in this context, to frame a key growth question that should be answered by the diagnostic.

In order to go through the differential diagnosis, Hausmann, Klinger and Wagner (2008) again propose to use the top-down decision-tree methodology. This approach starts with a certain problem and a theoretical approach to organise potential explanations (Hausmann / Klinger / Wagner 2008, 57).

As a starting point, it should be determined if any observed unsatisfactory outcome is either a supply problem or a demand problem (Hausmann / Klinger / Wagner 2008, 57). Following the idea that fast growth is associated with high levels of private investment and entrepreneurship, the main question in a country with low growth concerns the reasons for low levels of private investment and entrepreneurship. As a second step, one should differentiate between constraints based on low demand for investment or those based on the difficult supply of finance (see Figure 14). During the analysis, the aforementioned four principles should be applied.

Figure 14: A growth diagnostics decision tree



Source: Hausmann / Klinger / Wagner (2008, 23)

Following these steps allows for assessing the tightness of different constraints on growth (Hausmann / Klinger / Wagner 2008, 83). This should then lead to a logically consistent causal chain that accounts for the observed facts and is referred to by the authors as a syndrome (Hausmann / Klinger / Wagner 2008, 83). The soundness of the syndrome must be checked by deriving repeatedly other symptoms of the syndrome. Potential syndromes include, for example, a state that overborrows, a state that overtaxes, a state that underinvests, disruptions to the export sector or barriers to entry (Hausmann / Klinger / Wagner 2008, 85). This process will lead to a *"well-supported identification of what the binding constraints to growth are* *and why they are present"* (Hausmann / Klinger / Wagner 2008, 83). In accordance with understanding the most binding constraints for growth, any growth diagnostic concludes with a possible set of policy interventions aimed at accelerating growth.

9.1.2 Framework for growth identification and facilitation

Drawing on evidence of successful latecomers in industrial development, Lin and Monga (2010) also argue for a strong role for governments in industrial upgrading and diversification. But they emphasise that in order to be successful, any industrial policy *"must be anchored in industries with latent comparative advantage so that, once the new industries are established, they can quickly become competitive domestically and internationally"* (Lin / Monga 2010, 3). To identify the industries with latent comparative advantages and remove the constraints that are impeding their emergence, the authors propose a new framework, namely the framework for growth identification and facilitation. This approach draws both on empirical evidence and on theories of comparative advantage as well as the advantage of backwardness[91] and builds on a six-step process (Lin / Monga 2010, 17ff.). First, governments should identify a list of tradable goods and services that have been produced in a dynamically growing "compass economy" with endowment structures similar to those in their own country. The per capita income of this country should be about 100 per cent higher than their own. Second, priority should be given to the industries in which domestic private firms have been spontaneously established. Here, governments should try to identify factors that constrain the upgrading of these firms and possible entry barriers for other firms. This could be done by combining different methods such as the value chain analysis or the growth diagnostics framework (see above). Third, in industries that are completely new to domestic firms, the government could adopt specific measures to encourage foreign investment in these sectors from firms in the "compass economy". Fourth, the governments should also pay attention to possible self-discoveries by domestic firms in different industries and support their scaling-up. Fifth, in-

91 Developing countries in the process of catching up have an advantage of backwardness because they can rely on borrowing existing technology and industrial ideas from advanced countries, which makes innovation processes for them less costly and risky (Lin / Monga 2010, 7).

dustrial development could be facilitated by investments in industrial parks or export processing zones that also encourage industrial clustering. Finally, the government may provide limited incentives to domestic pioneer firms or foreign investors in order to compensate for the knowledge created by their investments.

In this approach, the facilitating role of the government is restricted to the provision of information, coordination of hard and soft infrastructure improvement, and compensation for externalities. But since the identified industries are consistent with the country's latent comparative advantage, this government facilitation should help to tap into the potential advantage of backwardness and provide dynamic and sustained growth (Lin / Monga 2010, 20).

Both these approaches (growth diagnostics framework and growth identification and facilitation) have been criticised for their impreciseness. With regards to the latter approach, Altenburg (2011, 31) argues that it not only ignores that products and related entry barriers have changed profoundly over 20 years, but also that focusing on per capita incomes does not say anything about the availability of entrepreneurial or technological skills. The growth diagnostics framework, on the other hand, ignores the systemic nature of competitiveness and does not differentiate between general and sector-specific constraints (Altenburg 2011, 31).

9.1.3 Value chain approach

Value chain approach exercises an in-depth analysis of industrial value chains in order to provide insights into an industry's or a country's most binding constraints. The general goal is to identify weaknesses or even outright failures during sourcing, manufacturing and delivery of specific products. Doing so, the method helps to detect the *"key public policy, institutional and infrastructure factors underlying constraints in the business environment"* (FIAS 2007, x).

The value chain approach builds upon the basic value chain analysis, which is *"a method for accounting and presenting the value that is created in a product or service as it is transformed from raw inputs to a final product consumed by end users"* (FIAS 2007, ix). Usually, four different aspects are analysed in order to get an understanding of the functioning of a specific value chain:

1. the undertakings during the different procession stages;
2. the value of inputs, the time required for processing, the value of outputs and the magnitude of value added;
3. the spatial dimension of the different undertakings (including questions of distance and logistics);
4. the structure and characteristics of the different actors involved (suppliers, producers, wholesalers).

Applying the value chain approach can help to identify priority areas for future policy. First, the approach helps to highlight the relevance and magnitude of incentives that are created through industrial or trade policies. Scrutinising and depicting an industrial value chain yields important factors that determine a company's competitiveness. This fosters an understanding of an industry's binding constraints, which eventually produces a policy and reform agenda. Policies – no matter if they are new regulations or reforms of existing regulations – should look at three main fields of intervention:

1. product markets
2. factor markets and
3. market-related issues such as *"market diversification, research and development, product diversification or supplier linkages"* (FIAS 2007, x).

There are still several problems with value chain approach that render the benefits of its application to be somewhat questionable. The analysis of existing industrial value chains essentially means an examination of an actual state. Though an exercise like that may yield important insights into a country's binding constraints, the focus remains limited to what is already there. The approach does not offer a starting point to look into the future and explore new products as well as techniques that might alter entire value chain set-ups profoundly. Moreover, a significant focus on government activities is inherent to the value chain approach. Although it is well understood that the government plays an important role in shaping a country's business environment (and hence should always create some of the thorough binding-constraint analyses), the emphasis might be too narrow, since it excludes other relevant stakeholders in the innovation system.

9.1.4 Technology foresight

Foresight activities offer a decent framework both for the identification of a country's binding constraints and for strategy formulation. Their general goal is *"to identify emerging generic technologies likely to yield the greatest economic and social benefits"* (UNIDO 2005, 7). Although foresight activities are (and must always be) both country-specific and context-specific, a number of shared aims can be identified. First, technology foresight activities aim to explore opportunities that the future holds in order to set investment priorities for the activities in the science and technology fields. Second, they contribute to both reorienting a country's science and innovation systems and demonstrating its vitality to all actors involved. Third, new actors shall be brought into strategy deliberations, and fourth, new networks and links across traditional fields, sectors and markets shall be built (UNIDO 2005, 7).

Technology foresight activities have become increasingly important over the past decades due to certain economic and societal developments. First, both on individual and country levels, competition has become fiercer – partly due to new economic players that have entered the scene. Second, constraints on public expenditure have become more aggravated, increasingly limiting governmental scope for action around the globe. Third, complexity has increased partly due to even closer integration and interaction between local, national, regional and global systems. Fourth, in an economic environment broadly depicted by these characteristics, scientific and technological competencies have increasingly become important (UNIDO 2005, 19ff.).

There are, however, several specific challenges for developing countries with regards to technology foresight activities that limit their benefits. Severe constraints on public budgets increase the difficulties of setting aside enough financial resources for foresight activities and R&D spending. The national science base (for instance, measured by the number of institutes and scientists) is often underdeveloped as well as underfinanced. As time horizons of foresight activities are beyond decision-makers' interests, the lack of strategic thinking as well as long-term horizons may stand in the way of thorough approaches. As foresight activities are comprised of extensive stakeholder dialogues, a lack of willingness to include actors from different spheres of the economy and society to listen to their opinions can prove to be detrimental (UNIDO 2005, 24ff.).

9.1.5 Multi-sector partnerships

The review of these different approaches and the discussion on their respective strengths and weaknesses has shown that none of them is all-encompassing. However, each of these approaches offers valuable elements that policy-makers should consider for a process of strategy-building. The growth diagnostics framework offers a structured method for identifying a country's pathway of growth and its most binding impediments. It therefore allows for identifying the constraints whose alleviation would have the biggest impact on economic growth. The framework for growth identification and facilitation, on the other hand, emphasises the importance of latent comparative advantages and proposes a process of how to identify them so that a developing country's government can facilitate sustainable economic growth. The value chain analysis approach constitutes a useful tool to identify niche markets in different parts of the value chain and opportunities for cost reduction. Technology foresight activities can be helpful in identifying emerging generic technologies and setting priorities for activities in the science and technology fields.

However, the earlier discussion on the principles of industrial policy (see Box 3 in Chapter 2) has shown that any promising attempt to identify latent comparative advantages and their respective binding constraints calls for a collaborative process that, ideally, should be systematic and professionally managed (Altenburg 2011, 31). This collaborative process may compensate potential market failures, such as information externalities and coordination failures, and allow for the required principle of embeddedness while also integrating learning effects and responding to change. *"What is needed* […] *is a more flexible form of strategic collaboration between public and private sectors, designed to elicit information about objectives, distribute responsibilities for solutions, and evaluate outcomes as they appear"* (Rodrik 2007, 112). Appropriate models of such a process include deliberation councils, supplier development forums, investment advisory councils, sector roundtables and private-public venture funds (Altenburg 2011, 31; Rodrik 2009, 23; Nelson 2007).

These models for strategic public-private collaboration are even more important when it comes to renewable energy development. In the context of green growth, the OECD (2013b, 95–96) argues that *"government needs to work both horizontally (across ministries) and vertically (across national, regional and local governments) so that policies relevant to green* *growth complement and support each other. Collaboration is also needed with civil society and the private sector to ensure that green growth policy takes into account a wide range of stakeholder interests."* Given that solar energy technologies cut across various sectors of the economy and levels of governance, such models could be relevant at the sectoral level, too.

A good way to manage this coordination is to establish a high-level, multi-sector partnership entity to "own" the solar industry development strategy, set objectives, coordinate policy implementation and manage its continuous improvement (OECD 2013b, 96). These private-public bodies allow for information exchange and social learning[92] and ought to include all relevant groups, regardless of their organisational character, in order to avoid biases of incumbents and insiders (Rodrik 2007, 113). These entities then act as the setting in which *"private-sector interests would communicate their requests for assistance to the government, and the latter would goad the former into new investment efforts"* (Rodrik 2007, 113). Deliberation councils may be created either at the national, subnational or sectoral levels and even require their own staff of technocrats. *"These councils would seek out and gather information* […] *on investment ideas, achieve coordination among different state agencies when needed, push for changes in legislation and regulation to eliminate unnecessary transaction costs or other impediments, generate subsidies and financial backing for new activities when needed, and credibly bundle these different elements of support along with appropriate conditionalities"* (Rodrik 2007, 113).[93] In a similar vein as technology

92 Rodrik defines social learning in industrial policy as *"discovering where the information and coordination externalities lie and therefore what the objectives of industrial policy ought to be and how it is to be targeted"* (Rodrik 2007, 112).

93 Deliberation councils that link governments, business and civil society have been an important institutional factor underlying economic growth in East Asian economies (Campos / Gonzalez 1999, 429). Campos and Gonzalez reviewed three successful deliberation councils in Singapore, Malaysia and Canada and, accordingly, identified common features that deliberation councils should consider in order to be successfully applied. First, any deliberation council should consist of a clear and specific mandate and be staffed with credible individuals representing a broad cross-section of relevant stakeholders (Campos / Gonzalez 1999, 443). The process of collaboration should be transparent, systematic and straightforward, while any decision-making would be by consensus, regarding an entire package of recommendations, and be expressed by one voice, namely the chairperson (Campos / Gonzalez 1999, 444). These features ensure open discussions, reduce the potential for lobbying and warrant the acceptance of the councils' recommendations so that they would be most likely transformed into policies.

foresight activities, a lack of willingness to include actors from different spheres might hamper the establishment of these bodies.

9.2 Overcoming constraints

Having highlighted the theory, we now turn to empirical perspective regarding the strategy development and implementation processes for the solar energy sector in Morocco.

9.2.1 Key constraints

Here, the most prominent constraints relating to the lack of an integrated development strategy for the solar energy sector include a **lack of transparency and predictability** with regards to Plan Solaire, concerns with regards to **inter-agency coordination** and the issue of **stakeholder consultation**. Below, we elaborate on each of these constraints. We then introduce a preferred approach for building such a strategy that draws on the strengths of the discussed theoretical approaches. Finally, we propose the creation of an entity in charge of overseeing the implementation of an integrated strategy for the solar energy sector.

9.2.1.1 Transparency and predictability

The issue of transparency and predictability relates mainly to the technology choice for the large-scale projects envisioned in Plan Solaire, which remains unclear. Here, it was commonly voiced by interviewees, both from the public and private sectors, that the lack of long-term market predictability hinders possible investments in different technologies. For example, representatives of MCINET mentioned that: *"If you want investors to invest, you have to know in which technologies to invest"*[94] (also see Chapter 6). Recent studies show that various components for solar energy technologies (both CSP and PV) could be manufactured in Morocco (Fraunhofer ISE 2012; World Bank 2011). However, potential investments in manufacturing require long-term market predictability in order to be realised. Since a clean

94 Interview with MCINET in Rabat on 16 February 2013; own translation from French.

technology choice for the four other large-scale solar plants envisioned in Plan Solaire has not been made yet, the will of companies to invest into manufacturing sites is hampered. As mentioned by an interviewee from the private sector, *"without a production visibility of 700–1,000 MW/year, it is not easy to open manufacturing facilities. You need a long-term visibility for the market."*[95]

The technologically neutral approach that the Moroccan government is following certainly allows for future flexibility, as the cost of certain technologies is expected to decrease over the next years. On the other hand, given the high capital requirements, such openness leaves companies that are interested in manufacturing without long-term prospects for the future solar market. The Moroccan government should carefully consider this trade-off. Building on these concerns, it was also mentioned by many companies that it is unclear what solar energy targets are envisioned for the period after the year 2020.

9.2.1.2 Inter-agency coordination

The launching of the National Energy Strategy has led to the reorganisation and creation of various Moroccan institutions with different responsibilities in the field of RE. These institutions and agencies each have different responsibilities and cover different areas of work, with the overarching aim to realise the energy targets and to base 42 per cent of the installed electrical capacity on renewable sources by 2020. However, this institutional segmentation calls for a strong inter-agency coordination in order to provide coherent policies for the development of the Moroccan solar energy sector and requires a certain steering capacity from key decision-makers (i.e. MEMEE, MASEN).

During the course of our empirical research, various interviewees from the public sector emphasised such a need for strengthened inter-agency coordination. Currently, there are instances of inter-agency coordination taking place. ADEREE, for example, is strongly cooperating with the Ministry of Housing, Urbanism and Policy of the City and with MEMEE in order to foster the deployment of SWHs. There are also emerging links between MASEN and MCINET to identify opportunities for integrated

95 Phone interview with a private company on 12 March 2013.

industrial development. Here, stronger cooperation would make possible to benefit from the experiences acquired by MCINET in the development of other industries, such as the automotive and aeronautics sectors. However, an institutionalised system of inter-agency coordination that reflects a systemic approach to the development of the solar energy sector and guides respective coordination is still lacking.[96] As of now, existing inter-agency coordination seems to be rather fragmented at the level of specific projects, rather than focused on building synergies between different actors and their core competencies.

9.2.1.3 Stakeholder consultation

A final issue relates to the inclusion of different stakeholders in the policy-making process. Here, it was mentioned by interviewees in the public sector that different processes of stakeholder consultation were in place. Various Moroccan ministries include consultations with relevant stakeholders in policy-making so that their interests are reflected in future policies. MEMEE, for example, conducts a process of stakeholder consultation before it presents a draft of a law to the parliament. Here, the official draft is sent to relevant stakeholders for comments. This not only allows for overcoming information externalities and coordination failures but also yields greater acceptance of future policies. However, the consultation processes vary for every ministry, and it remains unclear how their results are incorporated into policies.[97] For practical reasons, consultations with professionals in the private sector are conducted mainly through business associations; though there are some larger companies, mainly foreign companies, with direct access to policy-makers. Although AMISOLE seems to be strongly involved in the policy process, especially smaller companies have argued that their needs were not being represented enough in its work. Large companies also mentioned that, although AMISOLE is a valuable organisation, it cannot represent the interests of large businesses because it does not have the internal expertise with the specific needs in this business

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96 For example, the Ministry of Education does not seem to be systematically included in deliberations with regards to the direction for developing the solar energy sector.

97 A thorough assessment of these processes lies beyond the scope of this study and requires a long-term evaluation on how regularly these processes are conducted, which stakeholders they address and how these processes are followed up so that their results are included into policy-making.

segment. On a more general level, some companies were concerned with the lack of communication / transparency with regards to policy outcomes and existing support schemes. The cluster initiative for the solar energy sector, which has recently been initiated by MASEN, might serve as one measure to mitigate this constraint.

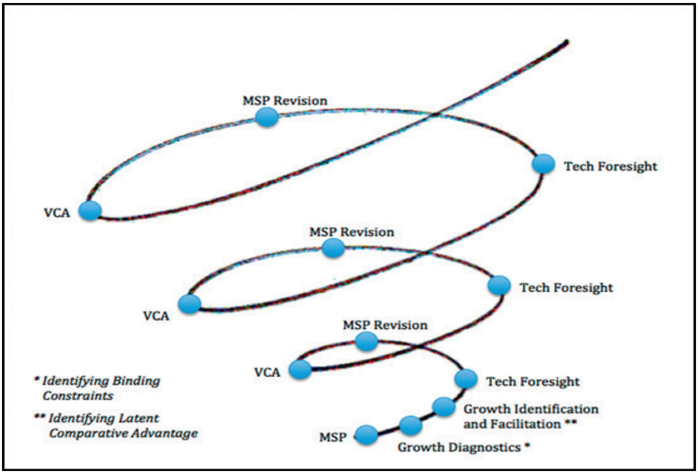
9.2.2 A strategic approach to the development of the solar sector in Morocco

As emphasised in our analytical framework, identifying an integrated strategy for developing the solar energy sector in Morocco through strategic policy coordination is critical, and hence an important component of achieving inclusive competitiveness. However, although respective targets for the inclusion of RE into Moroccan energy production have been agreed upon, an integrated strategy for the development of the Moroccan solar sector is still missing.

In this study, we therefore propose a process of strategy-building that draws on the multi-sector partnerships and at the same time includes the strengths of the other discussed approaches. Such a collaborative strategy would not only ensure the institutionalised participation of relevant stakeholders, but would also allow for more inter-agency cooperation, and offer more transparency and predictability with regards to the potential solar energy market.

Ideally, as Figure 15 illustrates, any process of national strategy-building should begin with a structured diagnosis of an economy's growth pathway and its respective impediments. At the same time, latent comparative advantages of a country should be identified. In order to include the relevant information on the constraints and needs of a nascent industry, this task should include relevant stakeholders from industry, civil society, academia and research. This task should not be a one-time activity but rather constitute a continual process in which policies and instruments are revised and updated on a regular basis (as the spiral in the figure shows). At different points in the course of this process, value chain analysis and technology foresight activities should be included in order to gain a recurrent overview of the needs and requirements of a specific industry.

Figure 15: A strategic approach towards the development of the solar energy sector



MSP: Multi-sector partnerships; VCA: value chain analysis; Tech Foresight: technology foresight

Source: Own illustration

Applied to the Moroccan context, a diagnostic of the growth trajectory and latent comparative advantages of the Moroccan economy should be carried out, with special emphasis on the solar energy sector. Although activities with regards to both value chain analysis[98] and technology foresight[99] have been conducted on specific issues, their results still need to be systematically assessed and translated into policies.

MCINET is currently in the process of elaborating such a development strategy for the RE sector. As per the ministry, a call for proposals to consulting / research institutes interested in assisting them with this study will

98 There have been various studies commissioned on the value chains of different solar technologies and the potential insertion of Moroccan companies into these value chains (i.e. Fraunhofer ISE 2012; World Bank 2011). The results of these studies should be included into the National Strategy for the development of the solar energy sector.

99 ADEREE is currently in the process of conducting foresight activities with different partners such as MAScIR, for example in the realm of marine energy.

be issued this year. We emphasise that this process should also build on former experiences with Le Pacte and aim at similar specificity.

9.2.3 The Moroccan Solar Energy Council

Once the Moroccan government elaborates an integrated strategy, we propose that its implementation should be overseen though a continuous multi-sector policy process to foster learning and adaptation to changing market conditions. A relevant example of such a collaborative process is the German National Platform for Electromobility (see Box 22). It brings together about 150 different stakeholders offering expertise from different technological domains while its steering committee ensures *"coordination and an efficient link between consultation and policymaking"* (Altenburg / Vidican 2012).

Box 22: National Platform for Electromobility

The German National Platform for Electromobility (NPE) is a joint council of the German government that was established in 2010. It includes representatives of industry, academia, government, unions and society and pursues *"a systemic, market-focused and technologically neutral approach with the aim of developing Germany into a lead provider of and a lead market for electromobility by 2020"* (National Platform for Electromobility 2011).

These objectives will be pursued in three phases:

1. market preparation over the period to 2014, focusing on research and development and showcase projects;
2. market ramp-up over the period to 2017, focusing on the commercialisation of vehicles and infrastructure;
3. launch of mass marketing over the period to 2020 with viable business models (National Platform for Electromobility 2011, 5).

NPE comprises seven working groups, each in charge of an issue relevant for electric mobility. The work of NPE is coordinated by its steering committee, which comprises the leaders of each working group and representatives of the German government. *"The fact that the secretariat is* *jointly staffed by four federal ministries with different interests (Education and Research; Transport, Building and Urban Development; Economics and Technology; Environment and Natural Resources) ensures that compromises are sought and a joint strategy is pursued"* (Altenburg / Vidican 2012). In accordance with these objectives, NPE thus suggested different measures to meet these objectives, including the promotion of research and development, political support in the form of incentives, and the establishment of pilot projects.

NPE is in charge of monitoring the implementation of all approved projects and measures and will continually both review the underlying assumptions and adapt the derived recommendations if necessary (National Platform for Electromobility 2011, 7). Therefore, an annual progress report will be prepared.

Other examples of such councils can be found in developing countries too, although with a focus on national development strategies rather than the sector level.[100] For example, the Philippine Council for Sustainable Development was established in 1996 to accompany the Philippine Strategy of Sustainable Development. The Council was the first of its kind in Asia and played an influential role in advising the President, the legislature and the cabinet on ways to integrate environmental considerations into economic and social policy-making and planning (OECD 2013b, 96).[101] Another example is Cambodia's National Council for Green Growth, created in 2013 (GGGI 2013) to implement the National Green Growth Roadmap adopted by an Inter-Ministerial Green Growth Working Group in 2010 (Kingdom of Cambodia 2010). The National Council for Green Growth is presided

100 The OECD provides the example of the National Councils for Sustainable Development (NCSD), introduced for the first time by the 1972 Bruntland Commission on Sustainable Development, established as inter-ministerial working arrangements. The NCSD provide a valuable *"mechanism for co-ordinated and principled working relationships among government, business and civil society"* (OECD 2013b, 97). The NCSD provide a means for reconciling priorities at local and national (and global) levels, and for translating global commitments into national and local initiatives and sustainable development priorities into concrete policies and actions (OECD 2013, 97).

101 Besides the advisory function at the national level, the Philippine Council for Sustainable Development has also been supporting local initiatives to create local councils for sustainable development through technical assistance and training (OECD 2013, 96).

over by the Prime Minister, chaired by the Minister of the Environment and coordinated by a general secretariat. The main task of this Council is to strengthen inter-sectoral coordination to avoid the development of conflicting government policies (OECD 2013b, 62).

Drawing on experience from other such multi-sector partnership bodies, two factors emerge as important (OECD 2013b, 96–97): (1) high-level leadership – leadership at the highest levels of government as well as the ministers charged with overseeing its activities can determine the success or failure of the strategy implementation process; (2) a clear role and mandate – clarifying the role and function in relation to other existing bodies can avoid conflict or duplication of activities with other groups, which can render the mechanism inactive.

For the Moroccan context, we therefore propose setting up a high-level forum with strong legitimacy and steering capacity to strategically steer the development of the sector, even in light of potential technology and market changes.[102] We call this proposed entity the Moroccan Solar Energy Council.[103] We stress the importance of having a separate (but representative) entity to oversee and assist with the implementation of an integrated strategy for two reasons. First none of the existing institutions currently has a mandate or the capacities and resources to assume this role. Rather, some kind of "umbrella" institution that brings together and strategically coordinates the work of existing agencies is needed. Second, due to the cross-cutting nature of the solar energy sector, where, for instance, solar energy applications are also highly relevant for other sectors (such as agriculture and housing), none of the policy-makers can address single-handedly the challenges presented by an integrated approach to the development of the solar energy sector.

Based on the model of the German National Platform for Electromobility and the Cambodian National Council for Green Growth, the Moroccan Solar Energy Council should constitute relevant actors from the government,

102 Similar to the high-level Moroccan Environmental, Economic and Social Council.

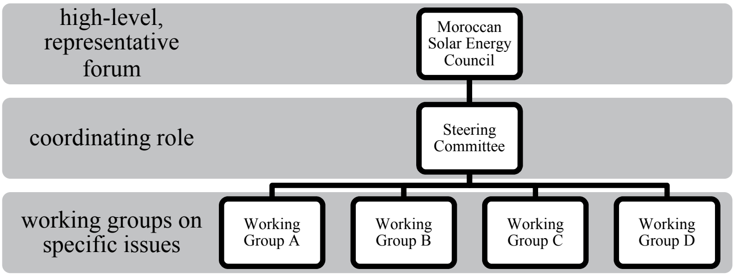
103 This council could either be set up to cover solely the development of the Moroccan solar energy sector or, following a broader approach, also include different renewable energies such as wind power. As mentioned in one interview with MASEN, this function could also be resumed by MASEN's "Comité de Pilotage". This Committee was agreed upon in a convention between the Moroccan state and MASEN in 2010 but has yet to hold a session.

research and industrial spheres. By involving not only governmental actors but also business representatives, the needs of foreign and local companies could be targeted more efficiently. As Bell (2007, 19) points out, this calls for entrepreneurs who are "technologically informed" so that they can *"engage in concrete terms with the details of technologies and their sources, potential costs and probable performance levels in specific local circumstances."* At the same time, the involvement of a broader set of stakeholders would allow for greater inter-agency coordination and more coherence of governmental actions and potential support schemes.

The Council should consist of a clear and specific mandate and be staffed with credible individuals representing a broad cross-section of relevant stakeholders. The process of collaboration should be transparent, systematic and straightforward, while any decision-making would be by consensus, regarding an entire package of recommendations, and be expressed by one voice, namely the chairperson (Campos / Gonzalez 1999, 444). These features would ensure open discussions, reduce the potential for lobbying and warrant the acceptance of the Council's recommendations, resulting in them most likely being transformed into policies.

Given the experiences of multi-stakeholder councils in other countries, we argue that the Moroccan Solar Energy Council should consist of **different working groups** relating to different issues concerning the development of the Moroccan solar energy sector (e.g. regulatory issues, industrial policy, industrial upgrading, knowledge and technology development, financing instruments) and a steering committee that is in charge of coordinating the work of the Council (see Figure 16). As such, the mandate of the Council is not only to participate in deliberations, set objectives, coordinate policy implementation and manage its continuous improvement. Rather, its role should also be to actively engage in elaborating high-level, in-depth reports on the strategic direction for developing the solar energy sector, using various tools described in Section 9.1. The recommendations of the Council would include concrete measures and actions aimed at supporting the development of the solar energy sector to be implemented by the respective government agencies.

Figure 16: Moroccan Solar Energy Council



Source: Own illustration

In order to ensure the appropriateness of these measures, the national strategy would include a clear **framework for policy evaluation and learning** so that incentive schemes and policy measures can be monitored and evaluated regularly and adjusted, if necessary (OECD 2013c, 93f.). The successful implementation of industrial policy requires a transparent system of *"carrots and sticks"*, which on the one hand encourages investments in non-traditional areas, but on the other hand sorts out projects that fail. Therefore, *"conditionality, sunset clauses, built-in programme reviews, monitoring, benchmarking, and periodic evaluation are desirable features of all incentive programmes"* (Rodrik 2009, 22) and facilitate the phasing-out of unsuccessful programmes. Every self-discovery involves a risky process of trial and error, but the important question is not if the government is able to *"pick winners and losers"* but if it is able to let go of the losers (Rodrik 2009, 22).

9.3 Policy recommendations

- Develop a national strategy for the industrial development of the solar energy sector in Morocco through a multi-stakeholder approach.
- Set up an entity such as the Moroccan Solar Energy Council to include a broad spectrum of relevant actors tasked with monitoring the implementation of respective development strategies for the Moroccan solar energy sector.

- Establish working groups on specific themes of the national strategy in order to develop specific recommendations and policy measures (and engage in specific technology foresight or value chain activities).
- Set up a steering committee consisting of expert members of each working group and representatives of the government to coordinate the work of different working groups.
- Ensure a transparent and collaborative approach to decision-making based on consensus.
- Put in place a framework for policy monitoring and evaluation to maximise learning from different initiatives.
- Elaborate regular high-level reports on the process and progress with the implementation of the national strategy and adjust its recommendations if necessary.

10 Conclusion

This study has assessed opportunities and strategies for enhancing inclusive competitiveness in the emerging solar energy sector in Morocco. We find that the vast solar energy resources in Morocco could be exploited for addressing not only energy security concerns, but also for responding to pressing social and economic needs. Although solar energy should not be viewed as a panacea for industrial development and employment creation, harnessing its potential can offer prospects for enhancing technological capabilities, for attracting private sector investment and for building linkages with leading technology firms. Ultimately, smart policy design that addresses trade-offs between different policy choices and technology characteristics can have long-lasting effects, stimulating spillover effects that can boost competitiveness across the economy.

The policy recommendations that we highlight in each of our chapters and the more detailed road map that follows them should guide policymakers in the decision-making process. Although not sufficiently discussed in this study, it is important to recognise and to stress that the development of the solar energy sector is embedded in a political-economy context that ultimately shapes the process by which this sector develops and also the outcomes. Political dynamics (reflected at the international,

national and sectoral levels) and dynamics between interests (which are oftentimes conflicting) of different stakeholders will ultimately affect the policy-making process. Therefore, it becomes critical to understand the development process thoroughly and to map the stakeholders involved and identify what their interests are in this process. The example of the subsidies for butane gas and its impact on the deployment of SWHs and SWPs (with broad reverberations on the economy and society at large) is illustrative of this complex policy-making process. Therefore, a core part of the strategic process is the formation of transformative coalitions between different stakeholders to enable change and support the process of development.

While the roles and effectiveness of different national-level stakeholders and policy-makers have been discussed at large, here we would also like to stress the important role that development cooperation agencies can play in supporting the national process of developing a competitive solar energy sector.

The role of development cooperation in the Moroccan solar energy sector can be manifold. Aside from the ongoing financial support for reaching the 2 GW solar energy target, development cooperation agencies (the German agencies being our main focus) should provide extensive technical assistance to Morocco. Especially GIZ, which is already implementing various projects in the RE sector, can play a role in facilitating linkages with the private sector and education and research institutions, and in offering policy support for the development of the sector.

Facilitating linkages between Moroccan actors in the solar energy sector and potential partners in Europe is important, and it can be achieved through direct interaction, cooperation and visits to solar exhibitions, with the purpose of promoting technology transfer and enhancing domestic capabilities. In these efforts, pairing experts in Germany with those in Morocco on specific projects and programmes can be beneficial.

Cooperation channels can also be further enhanced in the education and research sectors. This can be facilitated through exchanges between universities and research institutes that can both work on solar technologies and develop synergies together. Training modules, not only for students, but also for professors, can be a useful approach to strengthen the education sector and thus help to solve the issue of finding qualified personnel in the sector.

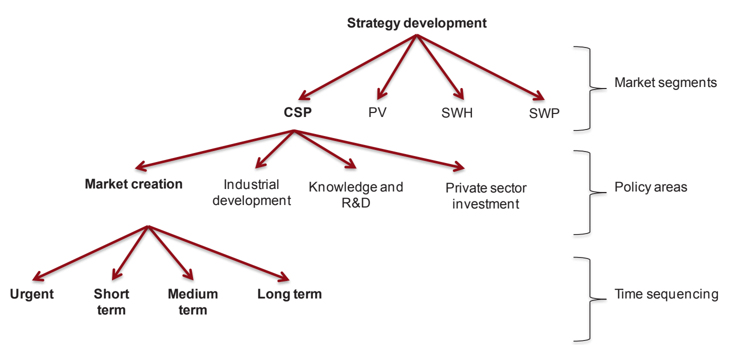
Policy support, which GIZ is already giving through the project ASPM-Project, supporting MASEN in implementing Plan Solaire, has proved to be an effective measure to support Morocco. Expanding these policy support programmes in collaboration with Moroccan partners (e.g. with respect to using FITs or net metering to deploy solar energy) is extremely important.

11 A road map for achieving inclusive competitiveness in the emerging solar energy sector

For an integrated development approach to solar energy in Morocco, the policy recommendations identified in the previous chapters should be targeted and prioritised based on their relative importance and based on their interdependence from other policy measures. As shown in Chapter 4, solar technologies have different characteristics and potentials to contribute to localising benefits with respect to job creation and industrial development. Hence, policies aimed at increasing competitiveness through improving framework conditions and fostering business linkages (as per our analytical framework) will differ.

Figure 17 illustrates how policy recommendations could be structured along different levels (i.e. by market segments, policy areas and timing) so that an integrated development process is ensured, starting from the development of a strategy in a coordinated, transparent and collaborative approach, as illustrated in Chapter 9.

Figure 17: Developing a road map for the solar energy sector



Source: Own illustration

The national strategy has to be built upon the existing capabilities and the comparative advantages of the solar energy sector in Morocco. For CSP technologies, the local contribution consists mainly in the construction of the plant, predominantly the civil works and the mounting and metal structures. For PV, SWHs and SWPs, local capabilities exist in the assembly of components and the electrical works, such as cables and inverters. In order to enhance capabilities and integrate Moroccan companies in the value chain, education and training, upgrading programmes, business linkages and financing is crucial.

Based on the findings discussed in this report, we highlight a few key policy measures for each solar energy market segment, starting with the overall process for developing and implementing an integrated strategy. These recommendations should be further refined in consultation with various stakeholders so that more actionable policy measures are identified. Nevertheless, these road maps should offer a starting point in this direction

11.1 Strategy development process

Key policy measures	**Urgent**	**Short-term**	**Medium-term**	**Long-term**
Develop a national strategy for the industrial development of the solar energy sector, using a multi-stakeholder approach				
Set up an entity such as the Moroccan Solar Energy Council				
Establish working groups on specific themes of the national strategy				
Set up a steering committee consisting of expert members from each of the working groups and representatives of the government				

Key policy measures	Urgent	Short-term	Medium-term	Long-term
Put in place a framework for policy monitoring and evaluation to maximise learning from different initiatives				
Ensure a transparent and collaborative approach to decision-making based on consensus				
Elaborate regular high-level reports on process and progress with implementation of the national strategy				

11.2 Concentrated solar power

Policy areas	Key policy measures	Urgent	Short-term	Medium-term	Long-term
Market creation	Ensure long-term visibility with respect to solar energy national targets				
	Enable renewable energy exports to Europe				
	Reinforce the national grid to reduce grid instability				
Industrial development	Enhance and targeting industrial upgrading programmes to increase capabilities in domestic firms				

Policy areas	Key policy measures	Urgent	Short-term	Medium-term	Long-term
Industrial development	Foster business linkages through various mechanisms				
	Support cluster formation				
Knowledge and R&D	Increase joint R&D funding				
	Expand education and R&D at universities and research institutes				
	Set up centres of excellence in niche technologies such as solar desalination				
Private sector investment	Enhance investment promotion services				
	Attract more diverse financing sources				
	Encourage domestic financial institutions to engage more actively in this sector				

11.3 Solar photovoltaics

Here we refer to residential PV, as the policy measures required for utility-scale PV are quite similar to those for CSP, with the exception of industrial development measures, which are quite specific to PV.

Policy areas	Key policy measures	Urgent	Short-term	Medium-term	Long-term
Market creation	Integrate solar PV technology more vigorously in the solar targets	■			
	Open the market for low- and medium-voltage projects	■			
	Set up a regulatory entity for the energy sector	■			
	Reform fossil-fuel subsidies		■		
	Apply incentive schemes such as net metering		■		
Industrial development	Enhance and target industrial upgrading programmes to increase capabilities in domestic firms	■	■		
	Foster business linkages through various mechanisms		■	■	■
	Support cluster formation		■	■	

Policy areas	Key policy measures	Urgent	Short-term	Medium-term	Long-term
Knowledge and R&D	Expand education and R&D at universities and research institutes				
	Set up centres of excellence in niche technologies				
Knowledge and R&D	Awareness-building at different levels of the society				
Private sector investment	Enhance investment promotion services				
	Attract more diverse financing sources				
	Encourage domestic financial institutions to engage more actively in this sector				

11.4 Solar water heaters

Policy areas	Key policy measures	Urgent	Short-term	Medium-term	Long-term
Market creation	Reform fossil-fuel subsidies				
	Integrate the technology in Ministry of Habitat strategy				
	Awareness-building at different levels of the society				

Policy areas	Key policy measures	Urgent	Short-term	Medium-term	Long-term
Industrial development	Enhance and target industrial upgrading programmes to increase capabilities in domestic firms, with respect to quality standards and local manufacturing of different parts and components				
Knowledge and R&D	Expand education and R&D at universities and research institutes				
Private sector investment	Enhance investment promotion services				
	Attract more diverse financing sources				
	Encourage domestic financial institutions to engage more actively in this sector				

11.5 Solar water pumps

Policy areas	Key policy measures	Urgent	Short-term	Medium-term	Long-term
Market creation	Reform fossil-fuel subsidies				
	Integrate the technology in the Ministry of Agriculture strategy				

Policy areas	**Key policy measures**	**Urgent**	**Short-term**	**Medium-term**	**Long-term**
	Awareness-building at different levels of the society				
Industrial development	Enhance and target industrial upgrading programmes to increase capabilities in domestic firms, with respect to quality standards				
Knowledge and R&D	Expand education and R&D at universities and research institutes				
Private sector investment	Encourage domestic financial institutions to engage more actively in this sector				

Bibliography

ACWA Power (Arabian Company for Water and Power Projects) (2012): MASEN and ACWA Power sign PPA for USD 1 Billion Ouarzazate CSP IPP; online: http://www.acwapower.com/news/post/35/masen-and-acwa-power-sign-ppa-for-usd-1-billion-ouarzazate-csp-ipp.htm (accessed 06 Dec. 2012)

ADEREE (National Agency for the Development of Renewable Energies and Energy Efficiency) (2013): Programme de développement des CES au Maroc "Shemsi"; online: http://www.aderee.ma/index.php/expertise/programmes-integres/programme-shemsi (accessed 09 Aug. 2013)

AfDB (African Development Bank) (2009): Appraisal report : national education emergence programme : Kingdom of Morocco; online: http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Kingdom%20Of%20Morocco%20-%20National%20Education%20Emergency%20Support%20Programme%20-%20Project%20Appraisal%20Report.pdf (accessed 04 Dec. 2012)

– (2011a): Financial sector development support programme (Programme d'Appui au Développement du Secteur Financier) : completion report; online: http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Morocco%20-%20Financial%20Sector%20Development%20Support%20Programme%20%28PADESFI%29-PHASE%20II%20-%20Project%20Completion%20Report.pdf (accessed 20 Oct. 2013)

– (2011b): Poverty and inequality in Tunisia, Morocco and Mauritania (Economic Brief); online: http://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/North%20Africa%20Poverty%20Anglais%20ok_North%20Africa%20Quaterly%20Analytical.pdf (accessed 20 Oct. 2013)

Allali, B. (2011): PROMASOL : democratizing access to solar water-heaters : GIM initiative case study; online: http://www.growinginclusivemarkets.org/media/cases/Morocco_Promasol_2011.pdf (accessed 07 Dec. 2012)

Altenburg, T. (2000): Linkages and spill-overs between transnational corporations and small and medium-sized enterprises in developing countries, opportunities and policies, Berlin: DIE (Reports and Working Papers 5/2000)

– (2005): Overview on international good practices in the promotion of business linkages : report prepared for UNCTAD's Department of Investment, Technology and Enterprise Development, Bonn: DIE

– (2007): Donor approaches to supporting pro-poor value chains : report prepared for the Donor Committee for the Enterprise Development Working Group on Linkages and Value Chains, Bonn: DIE

– (2011): Industrial policy in developing countries : overview and lessons from seven country cases, Bonn: DIE (Discussion Paper 4/2011)

– / *G. Vidican* (2012): Industrial development and employment promotion through renewable energy and energy efficiency technologies : international experience and policy options for southern and eastern Mediterranean countries : input provided to the Union for the Mediterranean in preparation for the Mediterranean Solar Plan, Bonn: DIE

AMDI (Moroccan Investment Development Agency) (2013a): They chose Morocco; online: http://www.invest.gov.ma/?Id=14&lang=en&Ref=75 (accessed 13 June 2013)

– (2013b): Atouts de la destination industrielle Maroc & Offre énergie Maroc : presentation at the conference "Filiere industrielle solaire : opportinités et défis", Skhirat, Morocco, 21 Jan. 2013

– (2013c): Investor protection; online: http://www.invest.gov.ma/?lang=en&Id=21 (accessed 16 May 2013)

Amsden, A. (2001): The rise of "The Rest" : challenges to the West from late-industrializing economies, New York: Oxford University Press

ANME (Tunisian National Agency for Energy Conservation) (2011): Tunisia solar thermal programme : residential, industrial and hotel sectors, Tunis

ANPME (Agence Nationale pour la Promotion de la Petite et Moyenne Entreprise) (2013): Programme imtiaz; online: http://www.anpme.ma/fr/declineServ.aspx?mod=2&rub=14&c=1 (accessed 18 April 2013)

Arab News (2013): Kingdom targets 41GW of solar energy by 2032; online: http://www.arabnews.com/economy/kingdom-targets-41-gw-solar-energy-2032 (accessed 16 May 2013)

AUC (American University in Cairo) (2013): About EIP; online: http://www.aucegypt.edu/Business/eip/Pages/AboutEIP.aspx (accessed 13 May 2013)

Azadegan, A. / S. Wagner (2011): Industrial upgrading, exploitative innovations and explorative innovations, in: *International Journal of Production Economics* 130 (1), 54–65

Barhdadi, A. / H. Attoch (2012): Overview of scientific research and development on solar energy in Morocco : conference paper presented at "Socio-economic development in the area of renewable energies : towards the creation of a research institution for the MENA region based on the DESERTEC concept", 3–4 Sept. 2012, Tunis

Bell, M. (1990): Continuing industrialisation, climate change and international technology transfer, Brighton: Science and Technology Policy Research, University of Sussex

– (2007): Technological learning and the development of production and innovative capacities in the industry and infrastructure sectors of the least developed countries : what role for ODA?; online: http://unctad.org/Sections/ldc_dir/docs/ldcr2007_Bell_en.pdf (accessed 20 Oct. 2013)

BIS (Department for Business Innovation & Skills of the Government of the United Kingdom) (2013): UK Green Investment Bank; online: http://webarchive.nationalarchives.gov.uk/20121017180846/http://www.bis.gov.uk/policies/business-sectors/green-economy/gib (accessed 22 May 2013)

Cammett, M. (2007): Business-government relations and industrial change : the policies of upgrading in Morocco and Tunisia, in: *World Development* 35 (11), 1889–1903

Campos, J. E. / J. L. Gonzalez (1999): Deliberation councils, government-business-citizen partnerships, and public policy-making : cases from Singapore, Malaysia, and Canada, in: *Asia Pacific Journal of Management* 16 (3), 429–447

CTF (Clean Technology Fund) (2009): Clean technology fund investment plan for Morocco; online: http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF%203b%20morocco_investment_plan_100708.pdf (accessed 20 Oct. 2013)

Dalakian, G. (2013): AUC launches new incubator for startups across Egypt; online: http://www.wamda.com/2013/06/auc-launches-new-incubator-for-startups-across-egypt (accessed 17 June 2013)

Dii (Desert Power Industrial Initiative) (2012): Desert power 2050, Munich

– (2013a): Desert power – getting started : the manual for renewable electricity in MENA, Munich

– (2013b): Economic impacts of desert power, Munich

DLR (German Aerospace Center) (2005): Concentrating solar power for the Mediterranean region : final report; online: http://www.dlr.de/Portaldata/1/Resources/portal_news/newsarchiv2008_1/algerien_med_csp.pdf (accessed 20 Oct. 2013)

– (2013): enerMENA : towards a sustainable implementation of solar thermal power in the MENA region; online: http://www.dlr.de/sf/desktopdefault.aspx/tabid-7235/12081_read-28723/ (accessed 20 Jan. 2013)

Enterprise Ireland (2013): Funding : supports & programmes; online: http://www.enterprise-ireland.com/en/ (accessed 18 April 2013)

EPIA (European Photovoltaic Industry Association) (2012): Global market outlook for photovoltaics until 2016; online: http://www.epia.org/fileadmin/user_upload/Publications/Global-Market-Outlook-2016.pdf (accessed 20 Oct. 2013)

Ernst, D. / L. Kim (2002): Global production networks, knowledge diffusion, and local capability formation, in: *Research Policy* 31 (8/9), 1417–1429

ESTIF (European Solar Thermal Industry Federation) (2013): The solar keymark; online: http://www.estif.org/solarkeymarknew/ (accessed 10 May 2013)

Evans, P. (1995): Embedded autonomy : states and industrial transformation, Princeton: Princeton University Press

Falconer, A. / G. Frisari (2012): San Giorgio group case study : Ouarzazate I CSP, Venice : climate policy initiative; online: http://climatepolicyinitiative.org/wp-content/uploads/2012/06/Ouarzazate.pdf (accessed 20 Oct. 2013)

Fattouh, B. / L. El-Katiri (2012): Arab human development report : energy subsidies in the Arab world, New York: United Nations Development Programme, Regional Bureau for Arab States (Research Paper Series)

FENELEC (National Federation of Electricity, Electronics and Renewable Energies) (2012): List of companies in FENELEC's membership classified by association; online: http://www.fenelec.com/English/fenelecmembers/index.html (accessed 10 Dec. 2012)

FIAS (Foreign Investment Advisory Service) (2007): Moving toward competitiveness : a value chain approach, Washington, DC: World Bank

FIPA (Foreign Investment Promotion Agency) Tunisia (2013): Invest in Tunisia; online: http://www.investintunisia.tn/site/en/home.php?id_article=848 (04 May 2013)

Fraunhofer ISE (Institute for Solar Energy Systems) (2012): Support for the Moroccan solar plan : solar technologies in Morocco, industry and value chain assessment; online: http://www.giz.de/Themen/de/dokumente/giz2012-en-solar-plan-morocco.pdf (accessed 21 Oct. 2013)

GCR (Global Credit Research) (2013): Moody's changes outlook on Morocco's Ba1 rating to negative from stable; online: http://www.moodys.com/research/Moodys-changes-outlook-on-Moroccos-Ba1-rating-to-negative-from--PR_265620 (accessed 19 April 2013)

Gereffi, G. (1994): The organization of buyer-driven global commodity chains : how US retailers shape overseas production networks, in: G. Gereffi / M. Korzeniewicz (eds.), Commodity chains and global capitalism, Westport, Conn.: Praeger, 95–122

GGGI (Global Green Growth Institute) (2013): Green growth : a greener Cambodia; online: http://gggi.org/green-growth-a-greener-cambodia/ (accessed 10 June 2013)

GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) (2012a): Legal frameworks for renewable energy : policy analysis for 15 developing countries, Bonn

– (2012b): Promotion of renewable energy and energy efficiency – the "PEREN" project; online: http://www.giz.de/Themen/de/dokumente/giz2012-renewable-energy-peren-en.pdf (accessed 11 Nov. 2012)

– (2012c): Réalisation d'une étude sur l'opportunité de l'utilisation du photovoltaïque résidentiel a grande échelle (décentralisé ou connecté au réseau basse tension au Maroc), report prepared and published by Deutsche Gesellschaft für Internationale Zusammenarbeit

– (2013): Renewable energy and energy efficiency in Tunisia – employment, qualification and economic effects; online: http://www.giz.de/fachexpertise/downloads/giz2012-en-employment-renewable-energy-tunisia.pdf (accessed 21 Oct. 2013)

Grant, P. (2011): Climate change financing and aid effectiveness : Morocco case study, Paris: Organisation for Economic Co-operation and Development

Griffith-Jones, S. / J. A. Ocampo / S. Spratt (2012): Financing renewable energy in developing countries : mechanisms and responsibilities; online: http://academiccommons.columbia.edu/catalog/ac:153326 (accessed 21 Oct. 2013)

Haimoud, A. (2013): Centre marocain de l'innovation : À vos projets, prêts… partez!; online: http://www.aujourdhui.ma/maroc-actualite/special-nouvelles-technologies/centre-marocain-de-l-innovation-a-vos-projets-prets-partez--102449.html (accessed 21 Oct. 2013)

Hanni, M. S. et al. (2011): Foreign direct investment in renewable energy : trends, drivers and determinants, in: *Transnational Corporations* 20 (2), 29–66

Hausmann, R. / B. Klinger / R. Wagner (2008): Doing growth diagnostics in practice : a "mindbook", Cambridge, Mass.: Center for International Development, Harvard University (CID Working Paper 177)

– / D. Rodrik / A. Velasco (2005): Growth diagnostics, Cambridge, Mass.: John F. Kennedy School of Government, Harvard University; online: http://www.hks.harvard.edu/fs/drodrik/Research%20papers/barcelonafinalmarch2005.pdf (accessed 21 Oct. 2013)

Haut-Commissariat au Plan du Maroc (2012): Taux de Chômage trimestriel selon le sexe; online: http://www.hcp.ma/Taux-de-Chomage-selon-le-sexe_a256.html (accessed 07 Dec. 2012)

Humphrey, J. / H. Schmitz (2002): How does insertion in global value chains affect upgrading in industrial clusters?, in: *Regional Studies* 36 (9), 1017–1027

IFC (International Finance Cooperation) (2011): Education for employment : realizing Arab youth potential, Washington, DC: International Finance Cooperation / Islamic Development Bank

ILO (International Labour Organization) (2011a): Global employment trends for youth : 2011 update, Geneva

– (2011b): Skills for green jobs : a global view, Geneva

– (2013): Global employment trends for youth 2013, Geneva

IMF (International Monetary Fund) (2011): Regional economic outlook : Middle East and Central Asia, Washington, DC

INSEAD / World Intellectual Property Organization (2012): The global innovation index 2012 : stronger innovation linkages for global growth, Fontainebleau

IRENA (International Renewable Energy Agency) (2011): Renewable energy jobs : status, prospects & policies, Abu Dhabi (IRENA Working Paper)

IRESEN (L'Institut de Recherche en Energie Solaire et Energies Nouvelles) (2013): Le photovoltaïque : technologies, marchés et intégration industrielle, Rabat

ISPAT (Investment Support and Promotion Agency of Turkey) (2013): Invest in Turkey; online: http://www.invest.gov.tr/en-US/Pages/Home.aspx (accessed 07 May 2013)

Johnson, O. (2013): Exploring the effectiveness of local content requirements in promoting solar PV manufacturing in India, Bonn: DIE (Discussion Paper 11/2013)

Jones-Evans, D. et al. (1999): Creating a bridge between university and industry in small European countries : the role of the Industrial Liaison Office, in: *R&D Management* 29 (1), 47–56

Kalamova, M. / C. Kaminker / N. Johnstone (2011): Sources of finance, investment policies and plant entry in the renewable energy sector, Paris: Organisation for Economic Co-operation and Development

Kim, L. (2000): The dynamics of technological learning in industrialisation; online: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.18.1244&rep=rep1&type=pdf (accessed 21 Oct. 2013)

Kingdom of Cambodia (2010): The national green growth roadmap; online: http://www.greengrowth.org/sites/default/files/pictures/Final%20Draft%20Roadmap,%20Feb26-2010.pdf (accessed 10 June 2013)

KOSGEB (Republic of Turkey Small and Medium Enterprises Development Organization) (2012): Enhancing the competitiveness of SMEs in Turkey : country report; online: http://www.comcec.org/UserFiles/File/%C3%BClkeraporlar%C4%B1/28_isedak_%C3%BClke_rap/T%C3%BCrkiye.pdf (accessed 08 May 2013)

Kuhlman, S. / R. van der Meijden (1989): University industrial liaison services in Europe : conference paper; online: http://publica.fraunhofer.de/documents/PX-37668.html (accessed 21 Oct. 2013)

Kuntze, J.-C. / T. Moerenhout (2012): Local content requirements and the renewable energy industry – a good match?; online: http://ssrn.com/abstract=2188607 (accessed 19 April 2013)

Lall, S. (2003): Reinventing industrial strategy : the role of government policy in building industrial competitiveness, Geneva: United Nations Conference on Trade and Development (G-24 Discussion Paper 28)

Lewis, J. I. (2007): Technology acquisition and innovation in the developing world : wind turbine development in India and China, in: *Studies in Comparative International Development* 42 (3/4), 208–232

Lin, J. / C. Monga (2010): Growth identification and facilitation : the role of the state in the dynamics of structural change, Washington, DC: World Bank (Policy Research Working Paper 5313)

LOG (Longreach Oil and Gas) (2010): The energy market in Morocco : why is energy demand growing in Morocco : key figures and drivers of growth, London

Masdar Institute (2013): Homepage; online: http://www.masdar.ac.ae/index.php (accessed 13 May 2013)

MASEN (Moroccan Agency for Solar Energy) (2011a): Brochure, Rabat

– (2011b): Plan solaire Marocain : un project intégré et structurant, Rabat

– (2012): Projet intégré de production électrique d'origine solaire : paper presented at the Solar Maghreb, Casablanca

MCINET (Ministry of Industry, Trade and New Technologies) (2009): Pacte National pour l'Emergence Industrielle : contrat programme 2009–2015, Rabat

– (2012): Maroc innovation initiative, Rabat

MEMEE (Ministry of Energy, Mines, Water and Environment) (2011): Moroccan energy strategy : overview, Rabat

Mezouar, S. / A. Benkhadra / A.. R. Chami (2011): Convention Cadre relative à l'appui et à l'investissement industriel dans le domaine des énergies renouvelables et de l'efficacité énergétique, Oujda municipality, Morocco

Milford, L. / R. Tyler / J. Morey (2011): Strategies to finance large-scale deployment of renewable energy projects : an economic development and infrastructure approach, Montpelier: Clean Energy Group

Morocco World News (2012): Standard & Poor's revises Moroccan economic outlook to negative; online: http://bigstory.ap.org/article/sp-revises-moroccos-economic-outlook-negative (accessed 19 April 2013)

Mytelka, L. K. (1999): Competition, innovation and competitiveness in developing countries, Paris: Organisation for Economic Co-operation and Development

National Platform for Electromobility (2011): Second report of the National Platform for Electromobility, Berlin: Federal Government Joint Unit for Electromobility

Navigant Consulting (2008): Economic impacts of extending federal solar tax credits, Burlington, Mass.

Nelson, J. (2007): Building linkages for competitive and responsible entrepreneurship, Vienna: United Nations Industrial Development Organization / John F. Kennedy School of Government, Harvard University

Nicola, S. / B. Parkin (2013): Nordex leads German clean-energy companies tapping Turkey; online: http://www.bloomberg.com/news/2013-04-11/nordex-leads-german-clean-energy-companies-tapping-turkey-growth.html (accessed 22 Oct. 2013)

Ockwell, D. et al. (2010a): Intellectual property rights and low-carbon technology transfer : conflicting discourses of diffusion and development, in: *Global Environmental Change* 20 (4), 729–738

– *et al.* (2010b): Enhancing developing country access to eco-innovation : the case of technology transfer and climate change in a post-2012 policy framework (OECD Environment Working Paper 12); online: http://www.oecd-ilibrary.org/content/workingpaper/5kmfplm8xxf5-en (accessed 22 Oct. 2013)

ODI / ECDPM / DIE (Overseas Development Institute / European Centre for Development Policy Management / German Development Institute) (2012): European report on development 2011/2012 : confronting scarcity : managing water, energy and land for inclusive and sustainable growth, Brussels: European Union

OECD (Organisation for Economic Co-operation and Development) (1992): Technology and the economy : the key relationships, Paris

– (2005): Assessment of challenges faced by MENA investment promotion agencies and development of investment promotion guidelines for the MENA region, Paris

– (2013a): OECD workshop on inclusive growth; online: http://www.oecd.org/inclusive-growth/Agenda%20-%20Workshop%20Inclusive%20Growth,%2003.04.2013%20EN.pdf (accessed 11 June 2013)

– (2013b): Putting green growth at the heart of development; online: http://www.oecd.org/dac/environment-development/greengrowthanddevelopment.htm (accessed 22 Oct. 2013)

– (2013c): Renewable energies in the Middle East and North Africa : policies to support private investment, Paris

ONEE (Office National de l'Elictricité et de l'Eau Potable) (2012): Programme de Développement des Energies Renouvelables au Maroc : paper presented at the Solar Maghreb conference : developing large scale north African solar markets, 22–23 May 2012, Casablanca

Pietrobelli, C. / R. Rabellotti (2006): Upgrading to compete : global value chains, clusters, and SMEs in Latin America, Washington, DC: Inter-American Development Bank / David Rockefeller Center for Latin American Studies / Harvard University

Porter, M. (1990): The competitive advantage of nations, New York: The Free Press

PTB (Physikalisch-Technische Bundesanstalt) (2012): Renforcement de l'Infrastructure Qualité pour l'Énérgie Solaire au Maghreb, Braunschweig

PWMSP (Paving the Way for the Mediterranean Solar Plan) (2011): Country report Morocco; online: http://www.pavingtheway-msp.eu/index.php?option=com_downloads&task=category&cid=7&Itemid=56 (accessed 22 Oct. 2013)

– (2012a): National road map for Morocco; online: http://www.pavingtheway-msp.eu/index.php?option=com_downloads&task=category&cid=8&Itemid=156 (accessed 22 Oct. 2013)

– (2012b): Power system 2020 : Morocco; online: http://www.enpi-info.eu/library/content/paving-way-mediterranean-solar-plan-%E2%80%93-power-system-2020-morocco (accessed 22 Oct. 2013)

– (2013): Sustainable energy policy road map : Morocco; online: http://www.pavingtheway-msp.eu/index.php?option=com_downloads&task=category&cid=11&Itemid=141&limit=10&limitstart=10 (accessed 22 Oct. 2013)

Rauniyar, G. / R. Kanbur (2010): Inclusive development : two papers on conceptualization, application, and the ADB perspective, Manila: Asian Development Bank

RCREEE (Regional Center for Renewable Energy and Energy Efficiency) (2010): Provision of technical support/services for an economical, technological and environmental impact assessment of national regulations and incentives for renewable energy and energy efficiency : country report Morocco (draft), Cairo

– (2013): Egypt : net metering systems; online: http://www.rcreee.org/news-media/news/2013/02/18/egypt-net-metering-systems/ (accessed 22 Oct. 2013)

REN21 (Renewable Energy Policy Network for the 21st Century) (2011): Renewables 2011 : global status report, Paris

– (2013): MENA renewables status report, Paris: Renewable Energy Policy Network for the 21st Century / UEA Directorate of Energy, Climate Change and International Renewable Energy Agency

Rignall, K. E. (2012): Land, rights, and the practice of making a living in pre-Saharan Morocco, theses and dissertations – anthropology, paper 3, University of Kentucky

Rodrik, D. (2007): One economics, many recipes : globalization, institutions, and economic growth, Princeton, NJ: Princeton University Press

– (2009): Industrial policy, don't ask why, ask how, in: *Middle East Development Journal* 1 (1), 1–29

Roy, R. B. (2012): Design and performance analysis of the solar PV DC water pumping system, in: *Canadian Journal on Electrical and Electronics Engineering* 3 (7), 403–412

Ruffing, L. (2006): Deepening development through business linkages, Geneva: United Nations Conference on Trade and Development

Rutovitz, J. / A. Atherton (2009): Energy sector jobs to 2030 : a global analysis, Sydney: Institute for Sustainable Futures, University of Technology

Sanchez-Ancochea, D. (2009): Are North-South trade agreements good for FDI-led development? : the case of DR-CAFTA, in: E. Rugraff / D. Sanchez-Ancochea / A. Sumner (eds.), Transnational corporations and development policy : critical perspectives, Basingstoke: Palgrave Macmillan

Schaettgen, M. / R. Werp (1996): Good practice in the transfer of university technology to industry; online: http://cordis.europa.eu/eims/src/eims-r26.htm (accessed 22 Oct. 2013)

Schutt, R. (2001): Investigating the social world : the process and practice of research, 3rd ed., Thousand Oaks, Calif.: Pine Forge Press

Shamamba, A. (2012): Le déficit budgétaire atteint des sommets; online : http://www.leconomiste.com/article/891167-le-d-ficit-budg-taire-atteint-des-sommets (accessed 20 Dec. 2012)

Srinivas, S. / K. Viljamaa (2002): Economic institutionalization in practice : development and the "third role" of universities, Boston, Mass.: Massachusetts Institute of Technology Industrial Performance Center; online: http://web.mit.edu/lis/papers/LIS05-002.pdf (accessed 22 Oct. 2013)

SSE (2013): The Green Investment Bank (GIB); online: http://www.sse.com/EnergyPolicy/FutureEnergyNeeds/Generation/GreenInvestmentBank (accessed 22 May 2013)

Stone & Associates (2011): Overview of the solar energy industry and supply chain; online: http://www.thecemc.org/body/Solar-Overview-for-BGA-Final-Jan-2011.pdf (accessed 22 Oct. 2013)

The Wall Street Journal (2013): Morocco's aviation industry takes off; online:http://online.wsj.com/article/SB10001424052970204059804577226763868263758.html# (accessed 22 May 2013)

UfM (Union for the Mediterranean) (2013): Mediterranean solar plan; online: http://ufmsecretariat.org/the-msp-in-short/ (22 May 2013)

UN System Task Team on the post-2015 UN development agenda (2012): Macroeconomic stability, inclusive growth and employment : thematic think piece; online: http://www.worldwewant2015.org/pt-br/node/311837 (accessed 22 Oct. 2013)

UNCTAD (United Nations Conference on Trade and Development) (2000): Enhancing the competitiveness of SMEs through linkages, Geneva

– (2006): Developing business linkages, Geneva: United Nations Conference on Trade and Development

– (2010): Creating business linkages : a policy perspective, Geneva

UNDP (*United Nations Development Programme)* (2013): What is inclusive growth?; online: http://www.ipc-undp.org/pages/newsite/menu/inclusive/whatisinclusivegrowth.jsp?active=1 (accessed 11 June 2013)

UNECA (United Nations Economic Commission for Africa) (2012): Etude sur les mécanismes innovants de financement des projets d'énergie renouvelable en Afrique du Nord – Rapport final, Addis Ababa

UNEP (United Nations Environment Programme) (2011): PROSOL : financing solar water heating in Tunisia; online: http://climatepolicyinitiative.org/wp-content/uploads/2011/12/Touhami-and-Hannane_PROSOL.pdf (accessed 22 May 2013)

– / *Bloomberg New Energy Finance* (2011): Global trends in renewable energy investment 2011 : analysis of trends and issues in the financing of renewable energy, New York

UNIDO (United Nations Industrial Development Organization) (2003): Methodological guide : restructuring, upgrading and industrial competitiveness, Vienna

– (2005): Technology foresight manual volume 1 : organization and methods, Vienna

US Department of Energy (2013): Solar water heaters; online: http://energy.gov/energysaver/articles/solar-water-heaters (04 Feb. 2013)

Veloso, F. (2001): Local content requirements and industrial development : economic analysis and cost modeling of the automotive supply chain, Cambridge, Mass.: Massachusetts Institute of Technology

Vidican, G. (2012a): Building domestic capabilities in renewable energy : a case study of Egypt, Bonn: DIE (Study 66)

– (2012b): Emerging innovation systems for renewable energy in the MENA : a comparative perspective on Egypt and Morocco : paper presented at the Conference on Climate Change and Development Policy, Helsinki, 28–29 Sept. 2012

– (s.a.): Reforming fossil-fuel subsidy regimes in the Middle East and North African countries, in: A. Pegels (ed.), Green industrial policy in emerging countries, London: Routledge (forthcoming)

– *et al.* (2012): An empirical examination of the development of a solar innovation system in the United Arab Emirates, in: *Energy for Sustainable Development* 16, 179–188

– / *A. Stamm* (2013): The role of higher education institutions in technology, innovation, and economic development in developing countries. Eschborn: GIZ Strategy Paper

WEF (World Economic Forum) (2011a): The Africa competitiveness report, Geneva: World Economic Forum / World Bank / African Development Bank

– (2011b): The global competitiveness report 2010–2011, Geneva

– (2012): The global competitiveness report 2011–2012, Geneva

– (2013a): The global competitiveness report 2012–2013, Geneva

– (2013b): Manufacturing for growth : strategies for driving growth and employment : executive summary; online: http://www3.weforum.org/docs/WEF_ManufacturingForGrowth_ExecutiveSummary_2013.pdf (accessed 22 Oct. 2013)

Wignaraja, G. (2002): Competitiveness strategy in developing countries : a manual for policy analysis, London: Routledge

World Bank (2007): Reform of butane subsidies and social protection of low-income households : request for expression of interest for consultancy services, Washington, DC: Development Gateway / World Bank

– (2010): Subsidies in the energy sector : an overview : background paper for the World Bank Group Energy Sector Strategy; online: http://siteresources.worldbank.org/EXTESC/Resources/Subsidy_background_paper.pdf (accessed 24 Oct. 2013)

– (2011): Middle East and North Africa region assessment of the local manufacturing potential for concentrated solar power (CSP) projects : report conducted for the World Bank by Ernst & Young et Associés, Fraunhofer Institute for Solar Energy Systems, Fraunhofer Institute for Systems and Innovation Research, Washington, DC

– (2012a): Energy imports, net (% of energy use); online: http://data.worldbank.org/indicator/EG.IMP.CONS.ZS (accessed 13 June 2013)

– (2012b): Inclusive growth; online: http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTDEBTDEPT/0,,contentMDK:21870580~pagePK:64166689~piPK:64166646~theSitePK:469043,00.html (accessed 06 June 2013)

– (2013a): Global investment promotion best practices 2012 : seizing the potential for better investment facilitation in the MENA region, Washington, DC

– (2013b): Morocco overview; online: http://www.worldbank.org/en/country/morocco/overview (accessed 13 Dec. 2012)

WTO (World Trade Organization) (2013): Glossary term: local-content measure; online: http://www.wto.org/english/thewto_e/glossary_e/local_content_measure_e.htm (accessed 19 June 2013)

Xinhua (2013): Maroc : 400 millions de dirhams mobilisés pour le programme de pompage solaire; online: http://www.africanaute.com/depeches/19555-programme-pompage-solaire-maroc-mobilise-400-millions-dirhams (accessed 26 June 2013)

YOIKK (Yatırım Ortamını İyileştirme Koordinasyon Kurulu) (2013): History of YOIKK ; online: http://www.yoikk.gov.tr/ (accessed 24 Oct. 2013)

Annexes

Annex 1: List of interviews

Type of Agency/ Company	Agency/Company	Sector of Activity (if applicable)	Position of Interviewee
Government	Agence Nationale pour la Promotion de la Petite et Moyenne Entreprise (ANPME)	SME Assistance	Head of Development
	Bourse Nationale de Sous-Traitance et de Partenariat (BNSTP)	SME Assistance	Président
	Moroccan Agency for Solar Energy (MASEN)	Government Agency	Senior Executive Advisor Board Member
	Ministère de l'Énérgie, des Mines, de l'Eau et de l'Environnement (MEMEE)	Policy-maker	Ingénieur Général, 1st adviser to the Minister
			Chef de la Division de la Distribution et du Marché élec-triques
			Chef de Service des Activités de Distri-bution
	Ministère de l'Ensei-gnement Supérieur, de la Recherche Scienti-fique et de la Forma-tion des Cadres	Policy-maker	Department of Technology
	Ministère de l'Habitat, de l'Urbanisme et de la Politique de la Ville	Policy-maker	Chef du Service de l'Efficacité et des Energies Renouve-lables

Type of Agency/ Company	Agency/Company	Sector of Activity (if applicable)	Position of Interviewee
Government	Ministère de l'Industrie, du Commerce et des Nouvelles Technologies (MCINET)	Policy-maker	Chef de Division des Industries Mécaniques, Métalogique et Électriques
	Ministère de l'Industrie, du Commerce et des Nouvelles Technologies (MCINET) Cluster	Policy-maker	Chef de la Division Recherche et Innovation
	Ministère de l'Industrie, du Commerce et des Nouvelles Technologies (MCINET) Ouarzazate	Policy-maker	Délégué du Commerce et de l'Industrie
	Office Nationale de l'Éléctricité et de l'Eau Potable (ONEE)	Utility	Directeur Pôle Développement
			Directeur Général Adjoint
	Centre Marocain de Production Propre	Consulting, SME Assistance	Directrice
Business Associations	German Chamber of Commerce (AHK)	SME Assistance, Consulting	Director
	Association des Industries Solaires et Éoliennes (AMISOLE)	SME Assistance, Lobbying	Directeur AMISOLE
	Chamber of Commerce Ouarzazate	SME Assistance	Directrice

Type of Agency/ Company	Agency/Company	Sector of Activity (if applicable)	Position of Interviewee
Business Associations	Confédération Générale des Entreprises du Maroc (CGEM)	SME Assistance, Lobbying	Commission of Green Economy/ Commission on Industrial Compensation
Private Sector	ADETEL	Large Company: Inverters, Electronic Components	Executive Management
	aephotonics	SME: SWP	CEO
	Alamjadid	Start-up: Information Technology	CEO, Founder
	ALSTOM	Large Company: Electronic Components	Président Directeur Général
	ALTO SOLUTION	Start-up: Solar Desalination	Executive Director
	CASATHERM	SME: SWH	Responsable prescription et développement produits
	Cegelec	Large Company: Project Developer, PV, CSP	Directeur du Développement

Type of Agency/ Company	Agency/Company	Sector of Activity (if applicable)	Position of Interviewee
Private Sector	CGI / Logica	Large Company: Information Technologies	Senior Vice President
	CLEANERGY	SME: PV Module Production	Président
	Companie Marocaine des Énérgies	SME: Wind, PV	Directeur Général
			Ingénieur projets
	Delattre Levivier Maroc	Large Company: Steel	General Manager
			Director Business Unit Infrastructures
	DPI Ingenierie	Large Company: Engineering Firm	Directeur Général
			Directeur Projets
	Energypoles	SME: SWH	Co-Chairman
			Co-Chairman
	ERDK	Start-up: SWH	Directeur Général
	GDF Suez	Large Company: Project Developer, PV, CSP, Wind	Membre du Comité Exécutif en charge des Relations Européennes et Internationales
	GE Energy	Large Company: Electrical Power	Programme Manager

Type of Agency/ Company	Agency/Company	Sector of Activity (if applicable)	Position of Interviewee
Private Sector	Hydrocentrale	SME: SWP	Gérant
	JET Energy	Large Company: CPV, PV	Project Manager
	MedZ	Large Company: Project Developer	Président du Directoire
	NAREVA Holding	Large Company: Project Devel-oper, Wind	Chairman & CEO
			Directeur Stratégie & Développement
			Project Manager
	Phototherme	SME: SWH, SWP	Ingénieur Gérant
	Schmid	SME: PV Machinery	Sales Manager
	Schneider Electric	Large Company: Electronic Components	Channel Manager
	SERA	SME: SWH, PV, SWP	General Manager
	SMA	Large Company: Inverters	Sales Europe & MENA
	Société Nationale des Transports et de Lo-gistique	Large Company: Logistics	Directeur Général

Type of Agency/ Company	Agency/Company	Sector of Activity (if applicable)	Position of Interviewee
Private Sector	Sunna Design	SME: Solar Street Lighting	Président, Fondateur
	Sunway Technology	SME: SWP, PV	Responsable Commercial
	Team Maroc	Large Company: Engineering Firm	Directeur Adjoint du Pôle Etudes Secto-rielles et Conseil
	TEKNA Energy	SME: PV, Wind, Biomass	General Manager
	Temasol	SME: PV	Directeur Général
	Valtronics	Large Company: Electronic Components	Directeur Général
			Director Advanced Electronics, Senior Vice President
Consulting	Association de Cluster Éléctronique, Méca-tronique et Mécanique du Maroc (CE3M)	Consulting, Cluster	Directeur Général
			Consultant
	iGreens	Consulting	Managing Director
	ISTICHAR	Consulting	Direction et Conseil d'Administration
	Roland Berger Strategy Consultants	Consulting	Director Morocco

Type of Agency/ Company	Agency/Company	Sector of Activity (if applicable)	Position of Interviewee
Academia	Centre National pour la Recherche Scientifique et Technique (CNRST)	Research	Head of the Unit of Renewable Energy Economy and Technologies
	École nationale de l'industrie minérale (ENIM)	School	Chef de département Génie des Procédés Industriels
	Insitute de Recherche en Énérgie Solaire et Énérgies Nouvelles (IRESEN)	Research	Directeur Général
	Moroccan Foundation for Advanced Science, Innovation and Research (MAScIR)	Research	Directeur Général Adjoint
			Science Advisor
	Université Al Akhawayn	University	Professor
	Université Fès	University	Responsable équipe de recherche en électrotechnique, électronique, de puissance et énergies renouvelables
	Université Moulay Slimane	University	Faculté Polydisciplinaire, Professor Telecommunications
			Professor Renewable Energies
			Professor Biomasse, Geothermie

Type of Agency/ Company	Agency/Company	Sector of Activity (if applicable)	Position of Interviewee
Academia	University Professors – Faculté Pluridisciplinaire	University	Doyen de la Faculté
			Génie électrique – Énergie éolienne
			Géographie
Finance	Attijariwafa Bank	Bank	Directeur Exécutif
	Agence Marocaine de Développement des Investissements (AMDI)	Investment Promotion Agency	Director of Development and Strategic Marketing
	Groupe BnP Paribas – Banque marocaine pour le commerce et l'industrie (BMCI)	Bank	Global Relationship Manager
	Brookstone Partners	Private Equity	Directeur Général
	Caisse Centrale de Garantie	Bank	CEO
	Caisse de Dépôt et de Gestion (CDG) Capital Infrastructure	Bank	Directeur Investissement
			Chargée d'investissement
	Centre Régional de l'Investissement (CRI) Ouarzazate	Investment Promotion Agency	Responsable Département Création d'Entreprise
			Chargé de Mission
	Société d'Investissements Énergetiques (SIE)	Investment	Director of Investment

Type of Agency/ Company	Agency/Company	Sector of Activity (if applicable)	Position of Interviewee
Development Cooperation	African Development Bank	Financing	Resident Representative, Morocco Country Office
	Gesellschaft für Internationale Zusammenarbeit (GIZ)	Technical Cooperation	Consultant, German Federal Environment Ministry support for the MSP
	Kreditanstalt für Wiederaufbau (KfW)	Financing	Chargé Principal de Projets Climat et Environnement
	Paving the Way for the Mediterranean Solar Plan	Consulting	Deputy Team Leader
	Union for the Mediterranean	Policy Advisor	Deputy Secretary General for Energy
Others	Almaouja	Media/NGO	Director
	Oxford Business Group	Think Tank	Africa Regional Editor
	Sahara Wind	Lobbying	Managing Director

Annex 2: List of codes used for text analysis

Stakeholders	Banks (national and international)	
	Investors (e.g. SIE)	
	Energy system (ONEE, *regies*, private distributors)	
	Policy agencies	ADEREE
		AMDI
		Chamber of commerce
		CRI
		Development cooperation
		Industry associations
		MASEN
		MCINET
		MEMEE
		Ministry of Agriculture
		Ministry of Education and Research
		Ministry Habitat
		Policy advocates (e.g. civil society, other advocacy groups)
	Enterprise profile	Project developer
		Manufacturer
		Distribution and/or installation
		Start-up
		Logistics
		Other
	Education and research institutions	Research institute
		University/School
	High-level government	High-level government (e.g. The King, Inter-ministerial Commission)

Technology	Cables
	CPV
	CSP
	Electronics
	Electrical equipment
	Other
	PV
	Solar lighting
	SWP
	SWH
	Wind energy
Business linkages	Joint venture / Partnerships
	Technology licensing / Intellectual property rights
	Education and training
	Technology / product acquisition
	Subcontractor
Investment conditions	Perception on investment climate in MOR
	Approach for attractive investment
	Incentives for attracting investors
Supplier development	Supplier development programmes
	Using local suppliers
	Local content
Employment	Training
	Assessment of human capital in Morocco
	Employment effect from RE
Strategy development	Stakeholder consultation
	Strategic approach
	Forecasting
	Visibility
	Value chain assessment

Academia/ research	Funding for research
	New educational programmes
	Challenges for universities
	Cooperation networks between academics
Research-industry links	Research-industry partnerships
	Incubator programmes
	Cluster
	Networking forums
	Training and hiring students
	Other research-industry links
Financing	Financing challenges
	Financing instruments
	Local bank involvement
Energy sector regulation	Market creation (includes FIT and other incentives)
	Low-voltage market (grid access)
	Medium-voltage market (grid access)
	Law 13-09
	Net metering
	Independent power producers (IPPs)
	Subsidies for solar energy
	Electricity price
	Fossil fuel subsidies
Industrial development (solar energy and Plan d´Emergence)	Offre Maroc (for solar)
	Existing incentives for enterprise development
	Strategic direction for industrial development
	Experience with other sectors' development (see reference to other sectors)

General solar energy sector assessment	Maintaining / increasing competitiveness
	Studies from other actors
	Specific challenges (e.g. butane gas, black market and quality standards)
	Specific opportunities (e.g. Desertec and export, Morocco as a regional hub)
	Industrial integration
	Other sector analysis
Organisation	History
	Main activities (includes turnover)
	Strategy
Personal back-ground	Personal background
Reference to other sectors	Aeronautics
	Agriculture
	Automotive
	Energy efficiency
	ICT
	Other
	PERG
	Telecommunications
	Wind energy
Best practices	Reference to best practices (e.g. policies, countries, strategies, sectors)

Specific reference to other countries	Algeria
	China
	France
	Germany
	India
	Other
	Other European countries
	Other MENA
	Spain
	Sub-Saharan Africa
	Tunisia
	Turkey

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