Overall Conclusions

In this study we have analyzed the local manufacturing potential of MENA countries for CSP technologies.

The **value chain of CSP technologies** and the international companies currently active along the value chain have been thoroughly assessed. Considering the strategies and interests of the main CSP technology manufacturers, they show a high potential to participate in future MENA CSP markets and are already involved in the ongoing three CSP projects in MENA (Morocco, Algeria, and Egypt). Depending on the market size in MENA countries, these companies also show substantial interest in building manufacturing capacities in the region. The minimum market size, for which local manufacturing is possible, strongly depends on the component under consideration. With a description of production and manufacturing processes for main CSP components, the complexity and required technological expertise were analyzed by focusing on key components for CSP: solar field with collectors, mirrors and receivers. Cost evaluation of current CSP projects indicates the high share of these components (solar field 38.5 percent) of the total investment. Industry forecasts also predict possible cost reductions ranging between 40 and 50 percent by 2025 due to efficiency increase, economies of scale and further technology improvements derived from research. In combination with an outlook on future cost reductions, this first step provided the technical and economic background for the assessment of local manufacturing of CSP components and service activities.

The **potential of industries located in MENA for local manufacturing** has also been assessed. Several industrial sectors that have the potential to integrate the CSP value chain in the MENA region are dynamic and competitive at a regional and sometimes at an international scale. As an example, the glass industry, particularly in Egypt and Algeria, has long been a regional leader and continues to increase its production capacity. The cable, electrical and electronic industries have established a similar position, especially in Tunisia and in Morocco. The success of these industries is enhanced by the development of joint ventures between

large international companies and local firms, but also by the local implantation of subsidiaries of international players.

The development of MENA CTF industries was initially driven by the low cost of labor and energy (the latter is particularly relevant for Algeria and Egypt) and also by the geographic proximity to Europe; delivery to Europe within 48 to 72 hours is possible. This efficient delivery to Europe is a key factor for short production cycles with variable specifications, for example components, cables, and wiring for the automotive sector.

In order to position themselves on the CSP market, MENA CTF industries face several challenges, and are adapting their industrial capacity to higher technology content (for example in the glass industry). The landscape is already changing; the situation of pure subcontracting is now shifting towards more local R&D and the production of high-tech components. MENA CTF countries are aiming to be considered as "centers of excellence" instead of low cost, skilled workshops. The shift towards higher technology content will require increased international cooperation. In the glass sector, for example, Guardian Industries have taken over the "Egyptian Glass Company," while a technology transfer agreement has been signed between PPG and Sphinx Glass.

Furthermore, the realization of flexible production lines might contribute to a mitigation of the risks related to the CSP market's evolution. For example, steel structure manufacturers usually adapt their production tools to different products with little effort.

Regardless of the identified obstacles to a participation of the local MENA industries, the expert interviews with MENA companies and with the existing CSP industry have shown an increasing potential for local manufacturing of components for CSP in case the CSP market grows continuously in MENA. Also, the participation of local firms in the provision of construction and engineering services for new CSP plants in the MENA region have been identified as an activity with promising growth in the future.

In a third step roadmaps and action plans have been presented for the key components and services of the CSP value chain. Technological, entrepreneurial as well as policy and market developments, which are crucial for the establishment of local manufacturing in MENA, have been emphasized. National strategies for industrial development and energy policy should be coordinated and involve clear targets for the market diffusion of CSP as well as substantial R&D efforts, strategy funds for industrial development of CSP industry sectors and stronger regional integration of policies. To enhance the innovative capacity of the industrial sectors, the creation of a larger number of technology parks/clusters and regional innovation platforms should be encouraged. These technology parks would particularly help small and medium-sized firms to overcome innovation barriers and to gain access to the latest technological advancements. Business models should build on the comparative advantages of certain sectors in MENA countries and also involve international cooperation agreements, e.g. in the form of joint ventures and licensing. In the case of receivers, subsidiaries of foreign companies will most likely be a relevant business model in the beginning.

The investment in new production lines based on highly automated processes for the mounting structure and in white glass production as well as adaptation of techniques for coating and bending, in the case of mirrors, will be the crucial first step. In order to engage in such investments, market actors will need good access to CSP—related information and certainty about the market development. Technical feasibility studies regarding production line upgrades could be an important element to assist enterprises. The creation of a regional CSP- or renewable energy association dealing with issues such as the CSP market development, manufacturing options and the latest technological advancements, might be an essential element in this respect. Entering local manufacturing will involve the comprehensive education and training programs for the industrial workforce in relevant sectors. Universities should be encouraged to teach CSP technology—based courses to educate potential workforce, particularly engineers and other technical graduates related to the CSP branch.

To assess the potential benefits of a steady growth of the CSP market in MENA, a dynamic economic modeling approach was used to determine the impact on economic value creation, foreign trade as well as job creation. The model considers a continuous local market based on the three different growth scenarios: Scenario C "Transformation" (5 GW domestic CSP plants by 2020 plus component exports for the equivalent of 2 GW), scenario B "No-replication" (1 GW by 2020) and scenario A "Stagnation" (0.5 GW by 2020). In the different market scenarios, the share of local manufacturing was dynamically modeled with respect to the required market size and the continuous growth of local technical expertise.

The MENA countries would obtain substantial economic and social benefits from a steady CSP market growth. The knowledge in renewable energy technologies would also increase which would induce further positive effects. In an optimistic scenario, the total potential of the local manufactured added value of CSP plants could reach almost 60 percent.

By 2020, the cumulated total jobs (one-year) for construction, manufacturing and O&M would increase to over 180,000 in scenario C. Considerably smaller effects have been identified for the two other scenarios: e. g. only 33,000 jobs would be created in scenario B.

Significant economic benefits for the MENA countries could also be attributed to growing export opportunities related to a developing CSP market. In the "Transformation" scenario (5 + 2 GW by 2020) a total local economic impact of US$14.3 billion was identified, compared to US$2.2 billion in the smaller scenario B.