Industrial integration of CSP technologies in Morocco

Chances and potential for Moroccan and international partners

ESMAP 2011 Knowledge Exchange Forum

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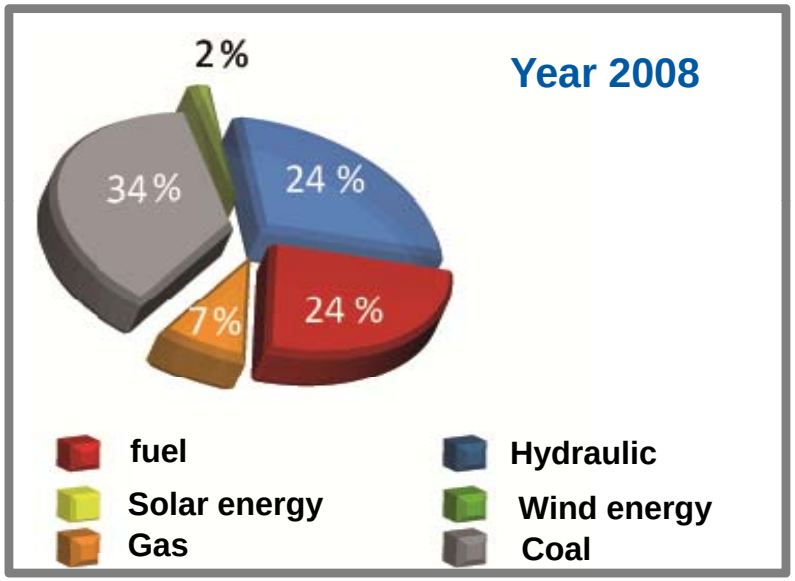
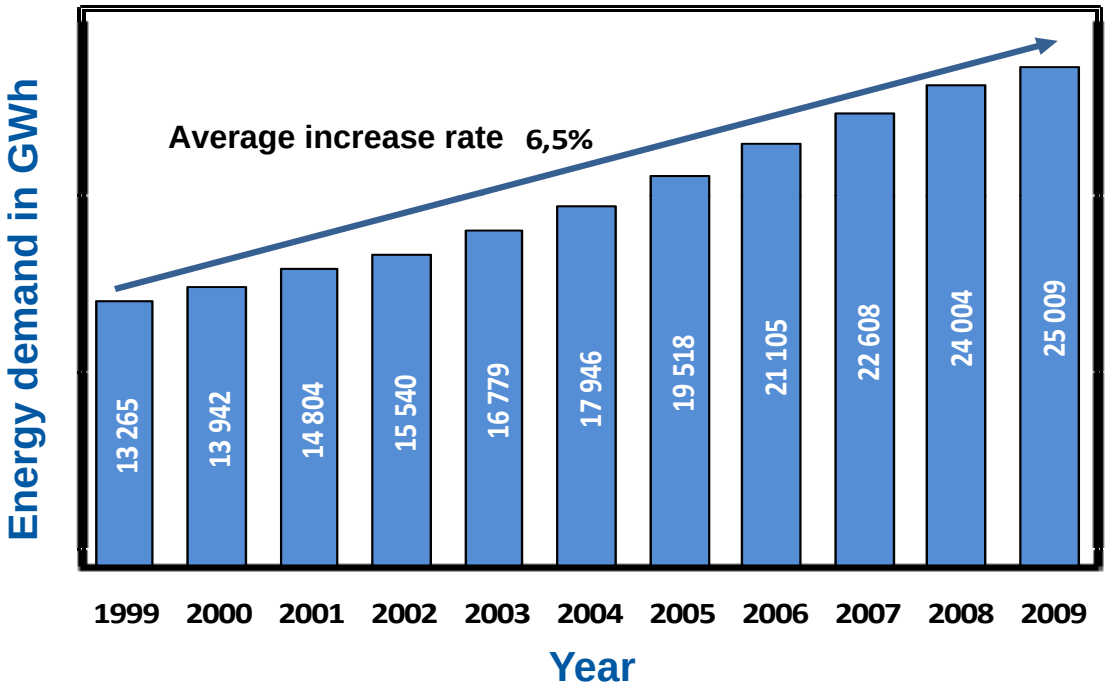
Current situation of energy supplies and demand

Structure of energy supplies



Annual energy demand



- 95 % of Morocco's energy demand is covered by imports
- 20 MW of CSP are already installed

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National energy strategy

Secured energy supply

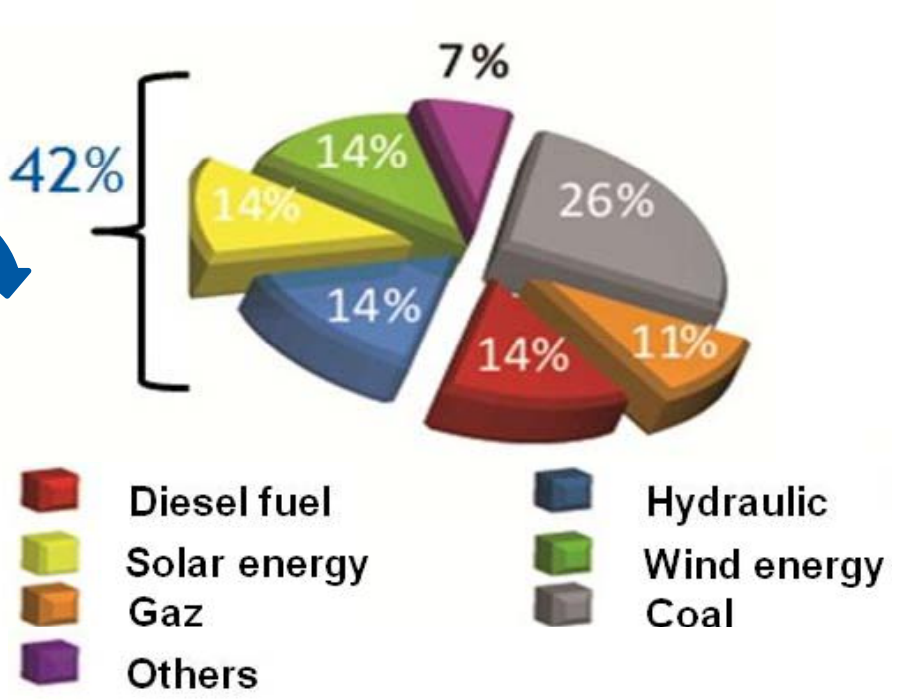
Positioning in the long-term development

Diversification of resources

Furtherance of renewable energies

Chances for social and economical development
R&D, local industries, competition, …

In the year 2020:
- **Share of renewable energies 42 %**
- **14 % solar energy**



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The Moroccan Solar Project

Power creation

Installation of solar power plants with an overall performance at least 2000 MW until 2020

Industrial integration

- **Identification of the potential of Moroccan industries to manufacture components for solar power plants**
- **Subsidy and furtherance**
- **Acquisition of expertise in the field of development**

Research and development

- **Identification of R&D subjects**
- **Financing R&D projects**
- **Creation of infrastructure for R&D**

Education

- **Definition of the required educational profiles**
- **Partnerships**
- **Support of the establishment of new educational programs**

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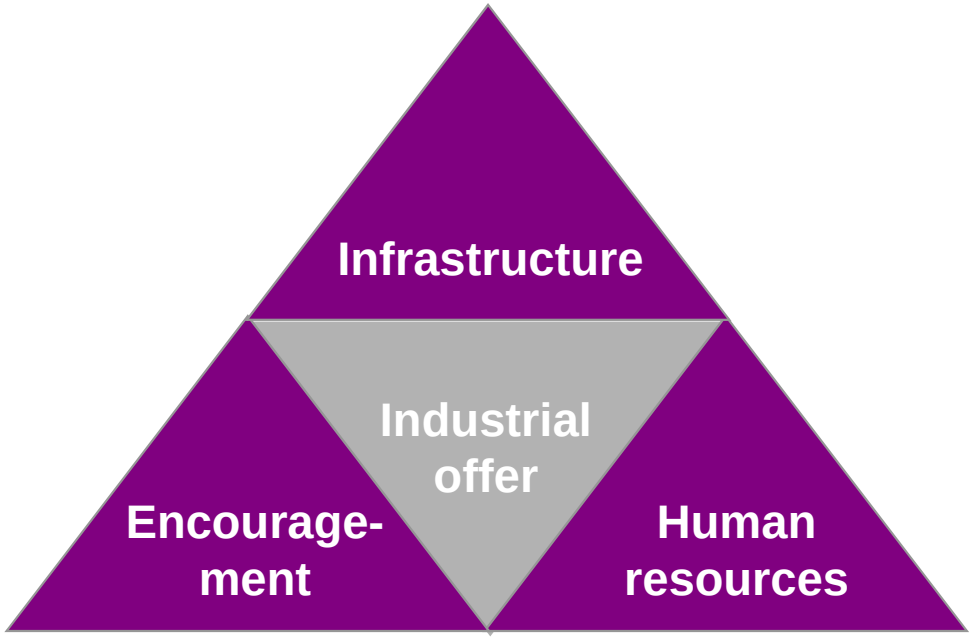
Industrial integration

Objectives

- **Establishment of industries along the entire value chain for components and plants in the field of solar energy including the required services**
- **Qualification of the Moroccan industry in the fields of R&D, manufacturing and services up to the ability of innovation**

Approach / strategy

Creation of the necessary conditions in the three pillars of industrial integration



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Industrial integration along with the first plant project

- Information based on a very usable study initiated by the World Bank with the title "MENA Assessment of the Local Manufacturing Potential For Concentrated Solar Power Projects

Output of the World Bank - ESMAP Study

- CSP value chains
- Required manufacturing processes
- Potential to cover certain steps of the value chain in Morocco
- Cost structure along the value chains

Advantages of the study for Morocco

Overview of required manufacturing processes and of the current manufacturing capabilities in Morocco

Local value addition opportunities for the first solar power plant project

Maximum utilization of investment due to high value addition

Abstract of the potential value addition in each value addition step based on the cost structures

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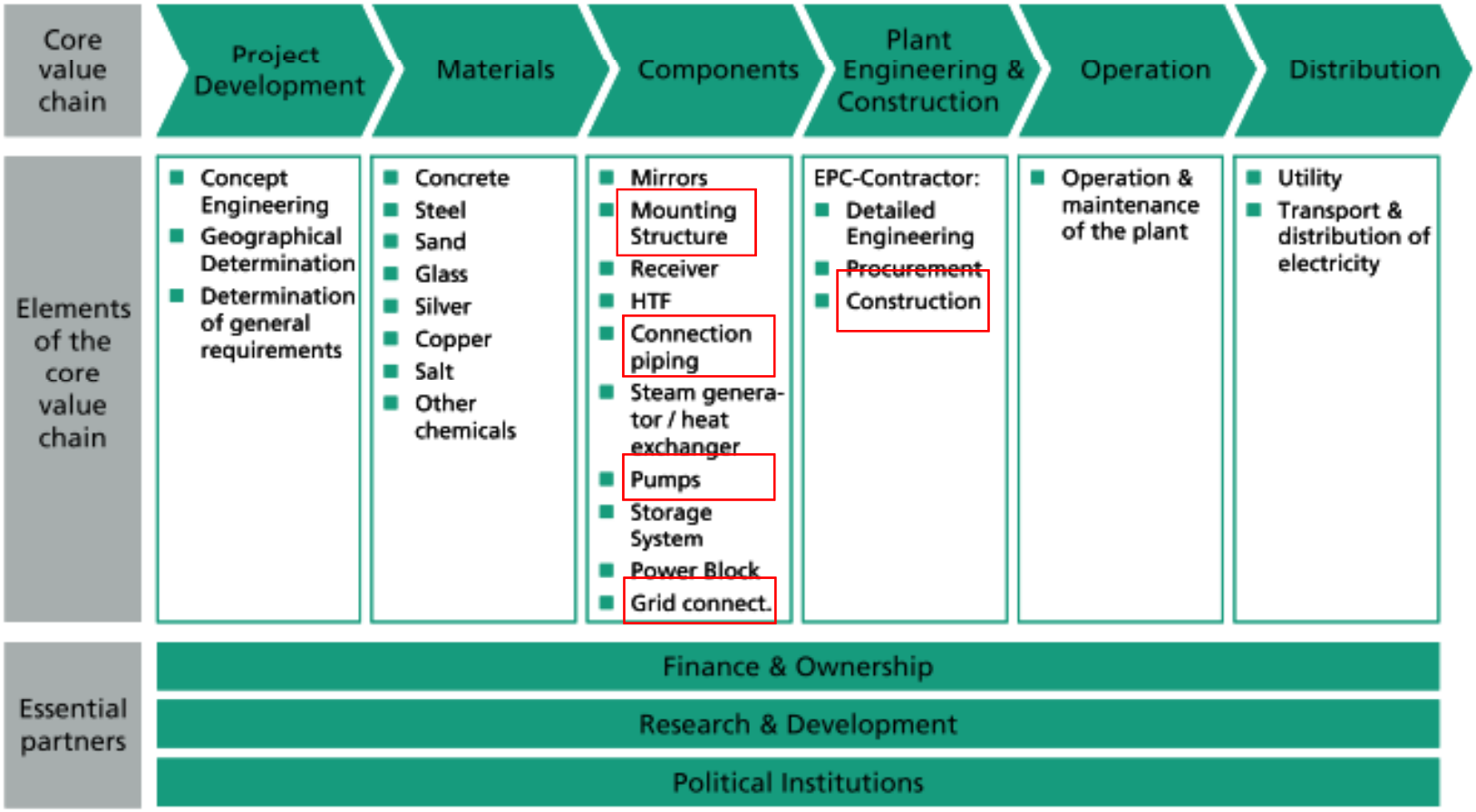
Data from the ESMAP Study

- **The value chain of CSP plants**



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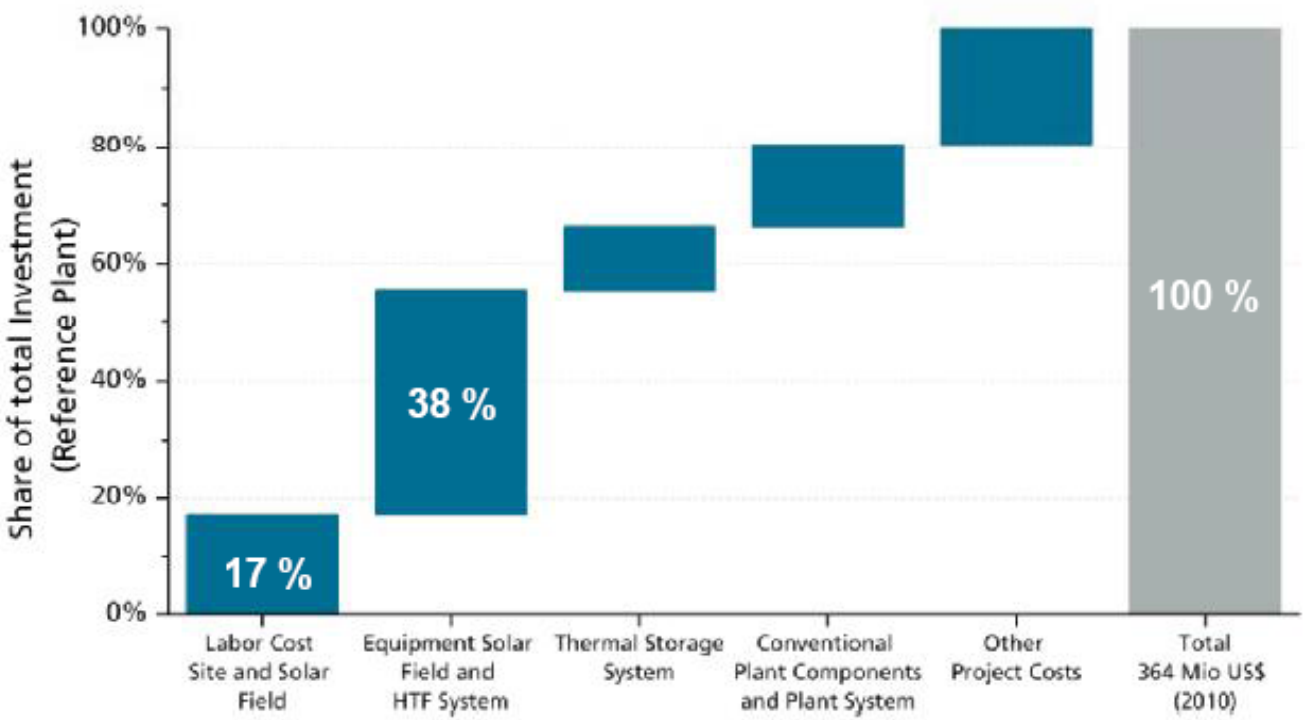
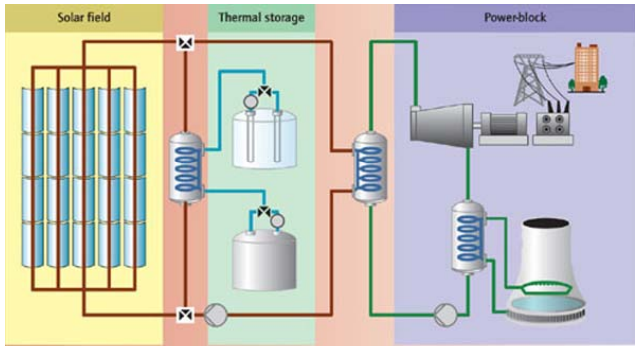
Data from the ESMAP Study

Cost structure of a parabolic trough plant with a capacity of 50 MW and 7 h thermal energy storage



Data:

- Parabolic Trough technology from Spanish market
- 50 MW with storage for 7hours
- Total investment 364 Mio US$ in 2010



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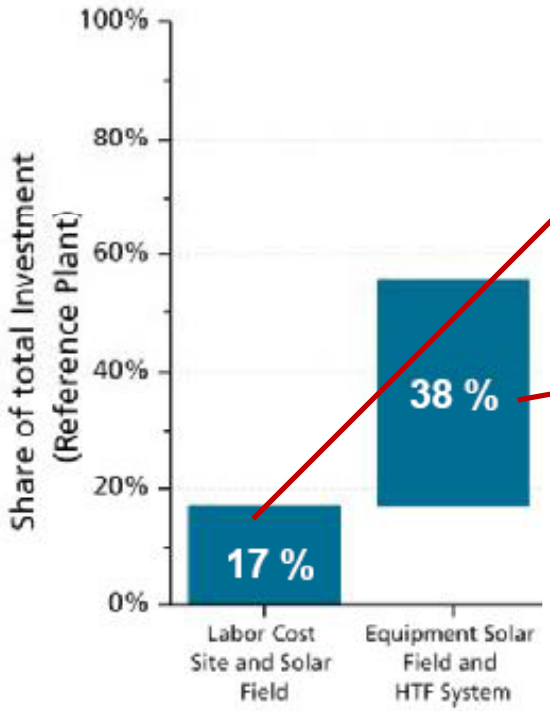
Use of the ESMAP Study

Sub-costs for in particular fields



Cost category and unit	Relative costs (relative value) compared to entire plant in %
Labor costs for site and solar field	17.14
Solar field	**3.11**
Site preparation, infrastructure	**5.82**
Steel construction	**2.5**
Piping	**1.75**
Electrical installations / others	**3.96**
Equipment: solar field, HTF system	38.54
Mirrors	**6.36**
Receivers	**7.11**
Steel construction	**10.71**
Pylons	**1.07**
Foundations	**2.14**
Trackers	**0.43**
Swivel joints	**0.71**
HTF System (Piping, pumps, …)	**5.36**
Heat transfer fluid	**2.14**
Electronics, controls, …	**2.5**

Potential in Morocco and high value addition

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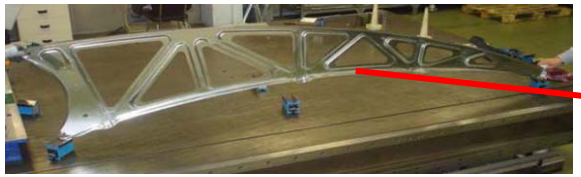
Some potential Moroccan players

Steel structures

Tubular cantilever arm

Torque tube

Tube profiles



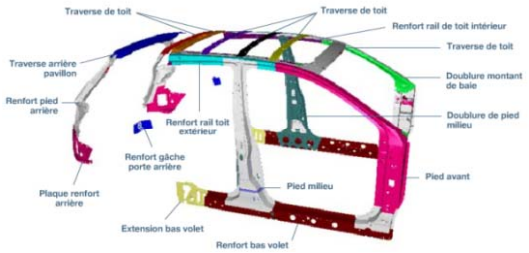
Metal stamping parts

Cables and electrics

Wide range of cables

Potential players / references

Maghreb Steel, menasteel, Leoni, Labinal, Nexans Maroc S.n.o.p. Maroc, Ynna Holding, ..



Sheet metal stamping parts for the automotive industry

Electrical tower

Building structure

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Potential for Moroccan companies to cover parts of the CSP in short term

There is a high potential for Moroccan companies to cover parts of the CSP value chain

Local value addition possible in %
min.: 27,78
max.: 38,46

Local value addition possible in Million USD
min.: 101,11
max.: 139,99

Based on a reference CSP plant of 50 MW at a total investment of 364 Million USD

- **Huge potential for Moroccan companies to participate in the realization of the Moroccan Solar Plan**
- **Actions to increase the percentage of local value**

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Roadmap of the ESMAP Study

Main objectives of the study:

1. Provide an overview of manufacturing processes, costs and cost reduction potential for key CSP components
2. Assess the potential for a CSP manufacturing industry in the MENA region
3. Establish roadmaps and an action plan for the development of local CSP manufacturing in MENA
4. Analyze potential economic benefits of a CSP component manufacturing industry in MENA

Source: The World Bank - ESMAP Study

- Approach in Morocco is to conduct a similar study for all CSP technologies
- Objective of maximizing local value addition on future plant projects

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Industrial integration - various CSP technologies

Parabolic Trough

Linear Fresnel

Dish Stirling

Solar Tower

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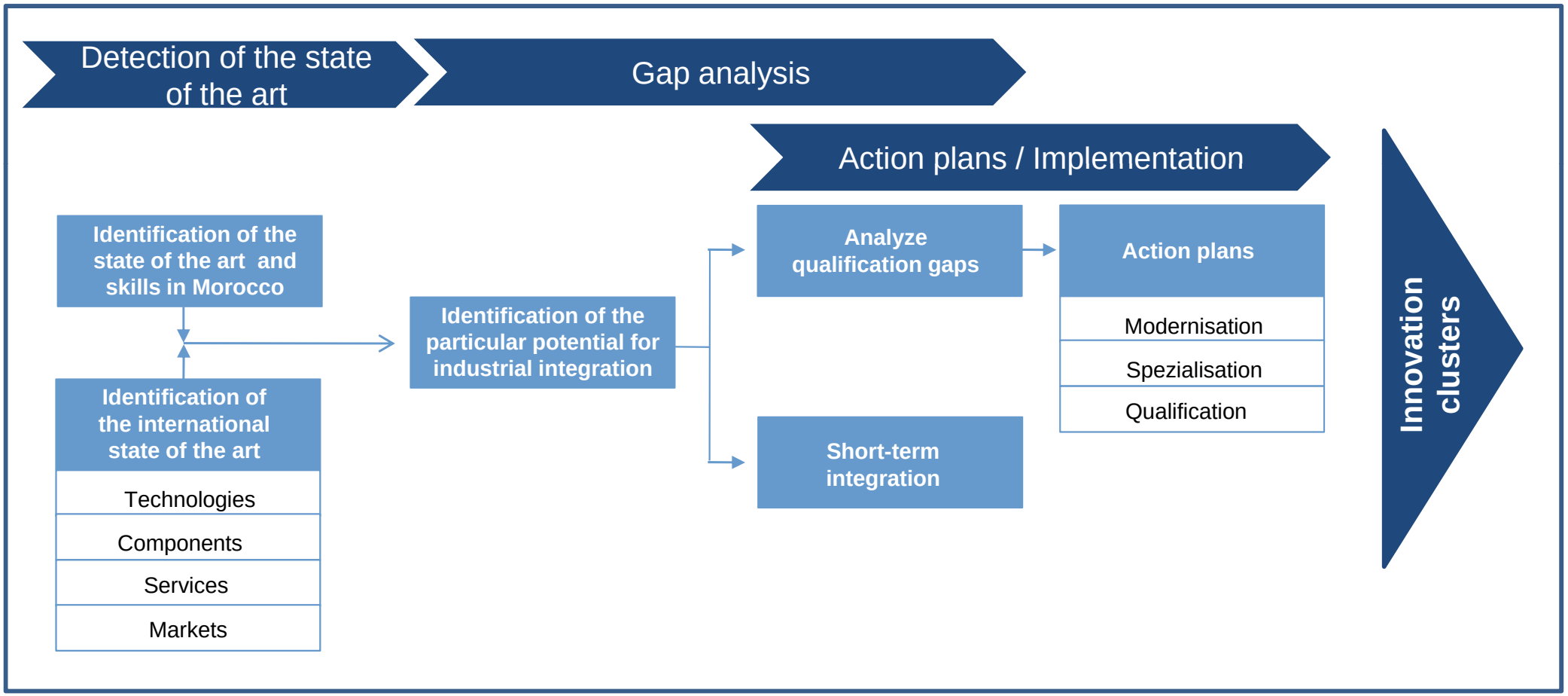
New study in Morocco for all CSP technologies based on the World Bank Study



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Actions to support the industry

- dedicated offer covering Infrastructure access at low price
- Tax benefits
- Subsidies for training, …

to be issued in the very short term

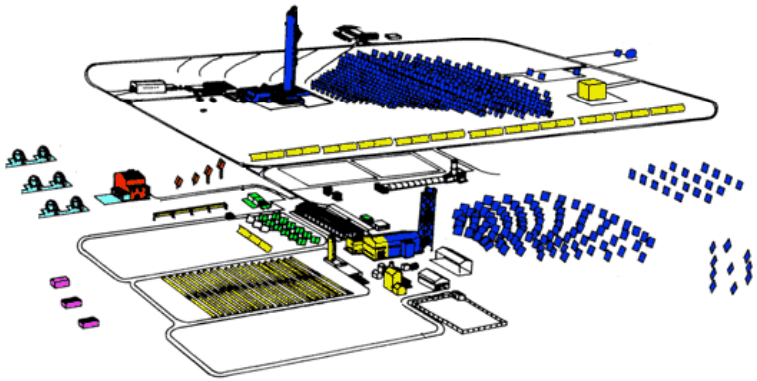
Actions to support the industry

R&D Project: Platform for applied research and development

Moroccan educational institutions

Moroccan industries

Moroccan R&D institutions

Physical	Platform for applied and pre-operational research in the field of solar technologies	Virtual
Demonstrators		Communication network including profiles of actors
Pilot projects		Knowledge database
Measurement facilities		Education
Space for industries	**MASEN F&E**	Information and contact point for companies

International educational institutions

International industries

International R&D institutions

Thank you for your kind attention

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