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WANDEL: Water Resources as Important Factor of the Energy Transition at the Local and Global Level

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GEFÖRDERT VOM



Bundesministerium
für Bildung
und Forschung

Agenda

- # **Water-Energy Nexus – State of the art**
- # Introduction research project WANDEL
- # Case study Concentrated solar power (CSP), Drâa Valley, Morocco

Current Research Focus

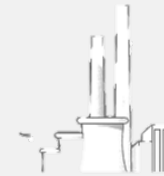
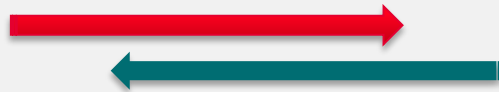


**Global and
national scales**



Water focus

Material and resource flows



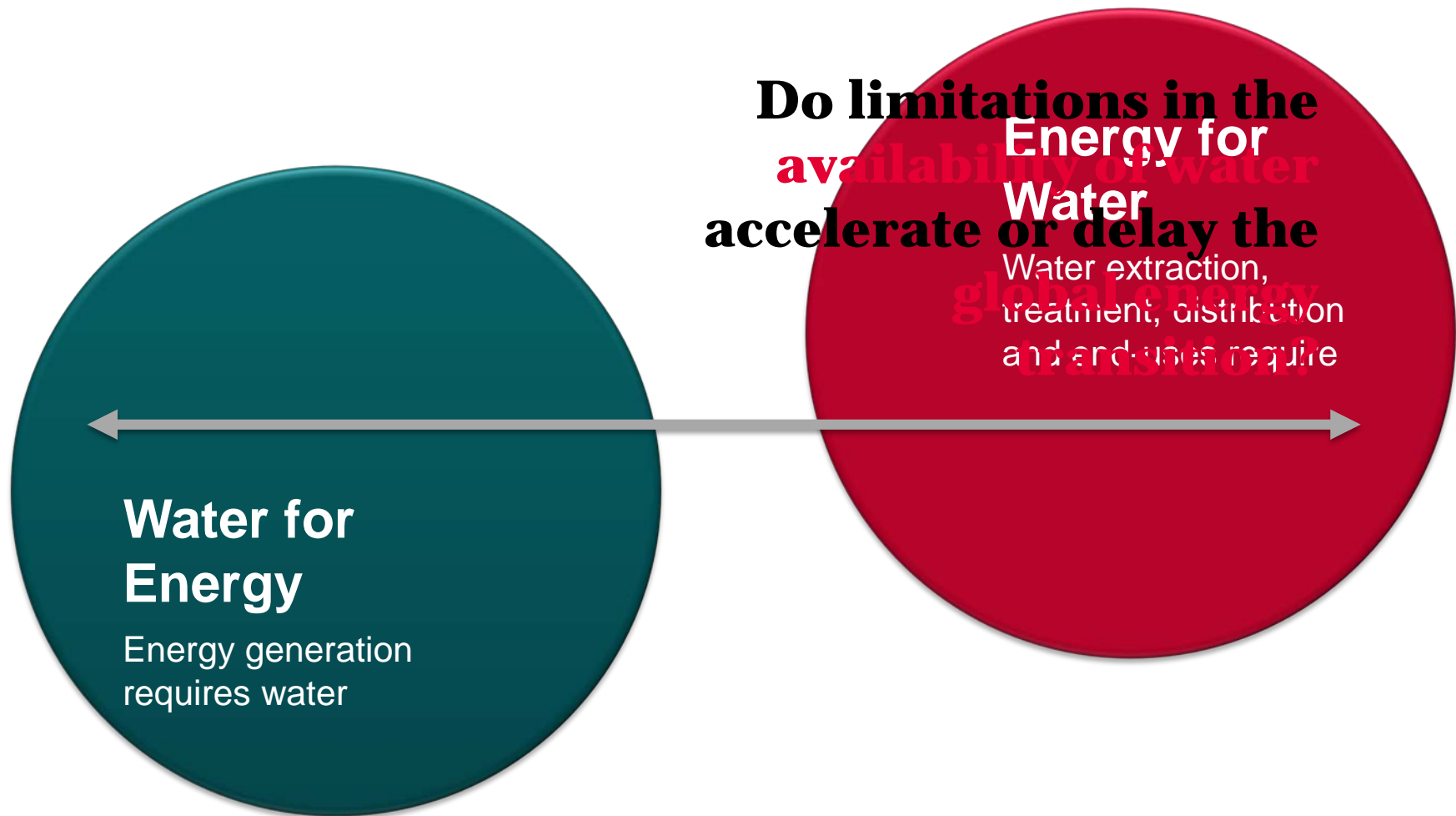
**Technical
assessments**

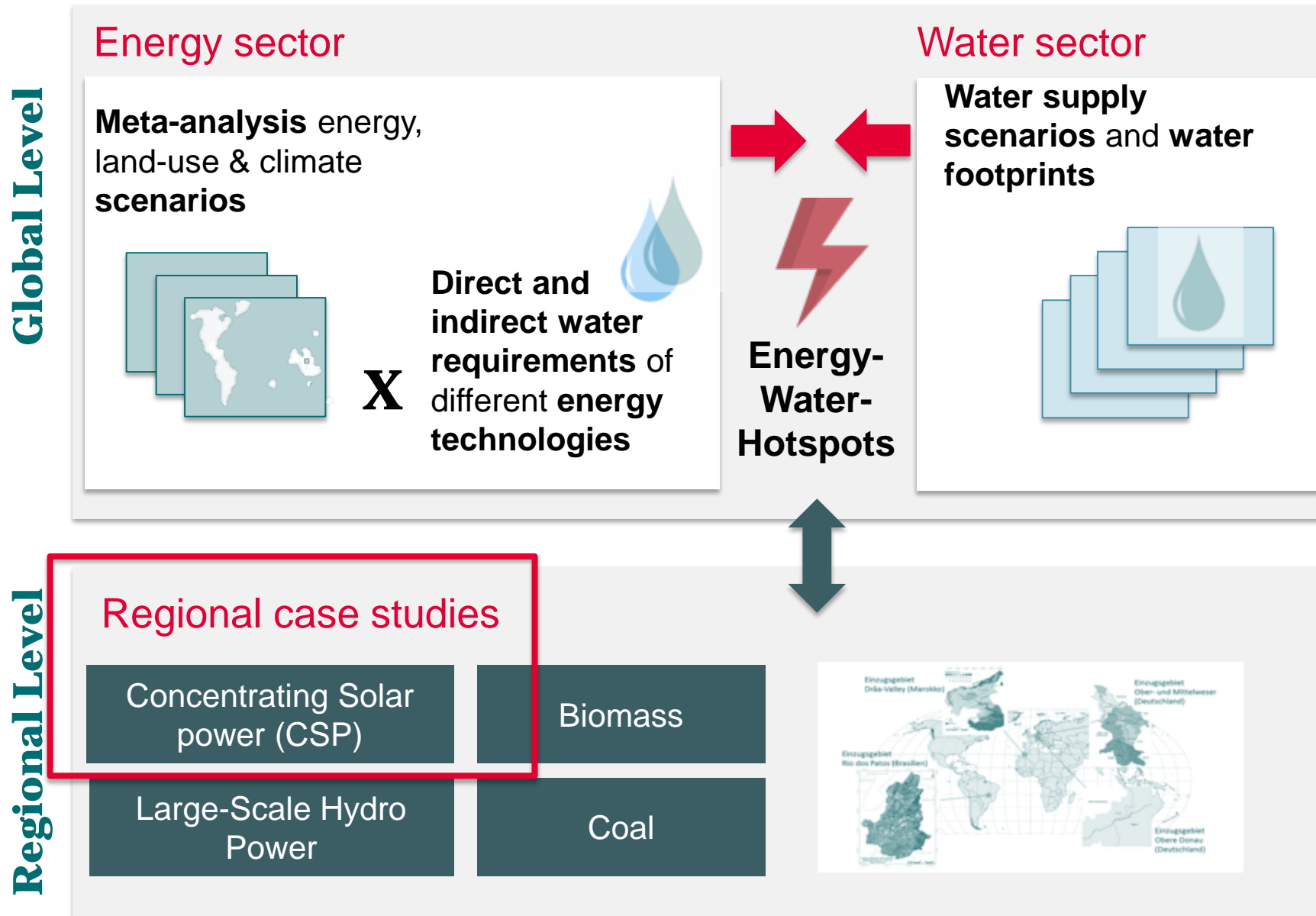
Research needs WEF- Nexus

- › Knowledge needs regarding the role of **renewable energies** in the nexus context (IRENA 2015)
- › Limited literature that focuses on all three sectors of the **nexus from a social science angle** (Leck et al. 2015)
- › Need to **focus on local level**, applying local solutions and decentralised approaches, as well as the inclusion of social aspects and development of people centred approaches (EC 2014)

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How to operationalize the WEF Nexus?

Nexus assessment approach to assess future developments

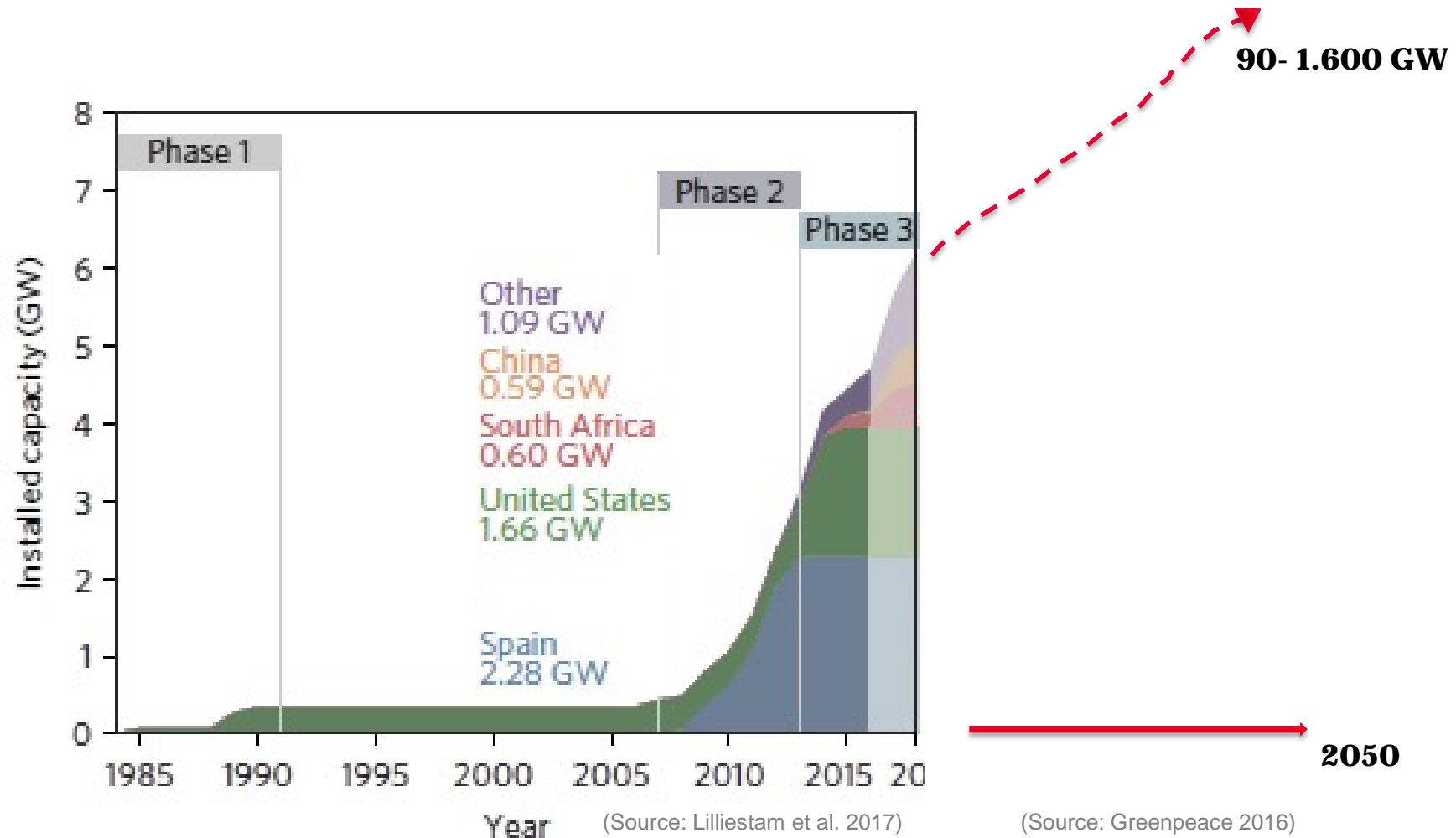
- 1. Mapping the links** between the water, food and energy sector **based on a qualitative analysis**
- 2. Identifying critical links** together with **local stakeholders**
- 3. Developing scenario** narratives and **quantifying the links**
- 4. Develop solutions** together **with local stakeholders** and **leverage the results** to e.g. improve project designs, support decision-making, give policy recommendations

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Case Study Concentrated Solar Power (CSP)

Global development forecast for CSP in 2050

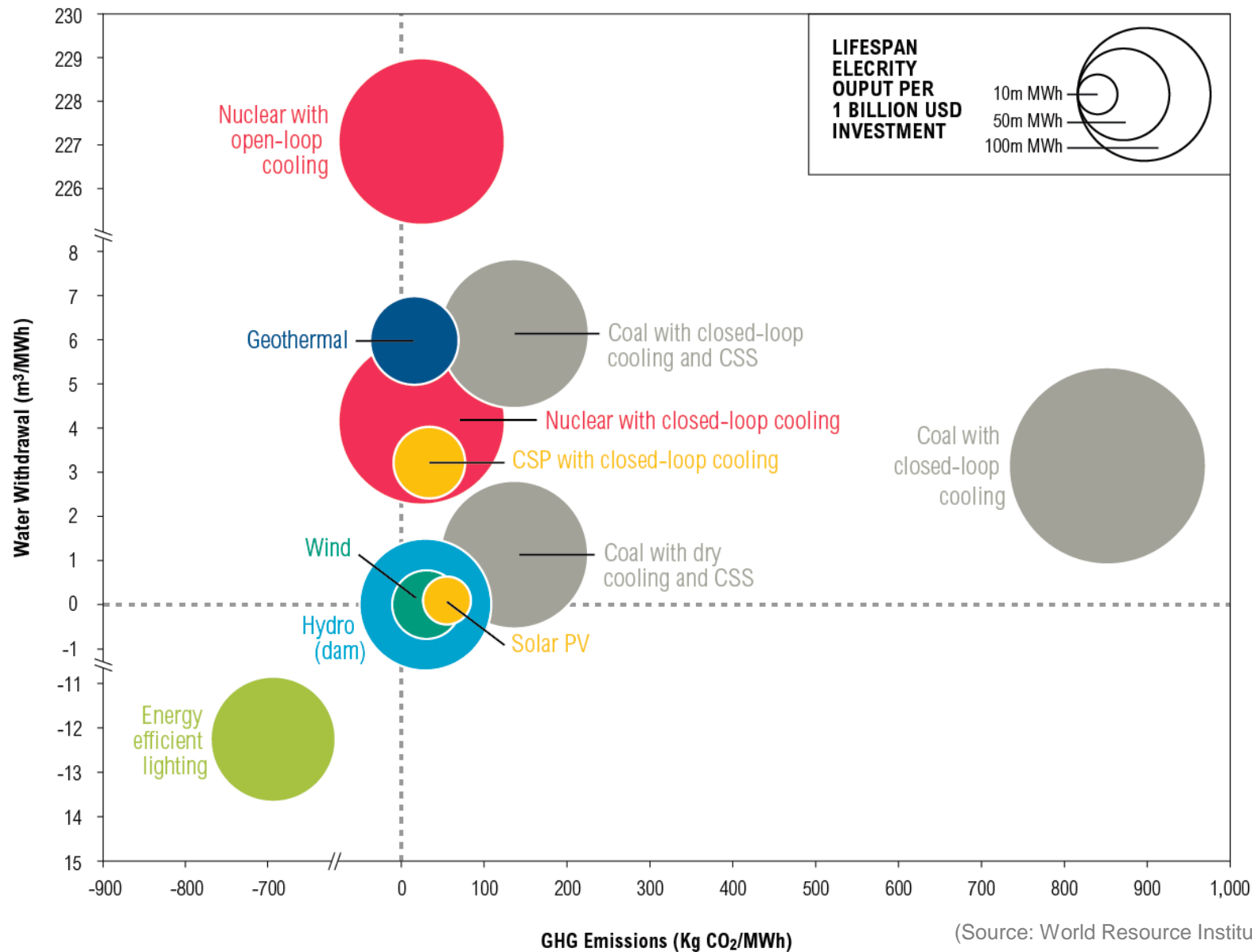


“In research, politics and industry **the issue of water conservation is a key challenge** in order to promote the **acceptance** and further **implementation** of CSP technology.”

(DLR 2016)

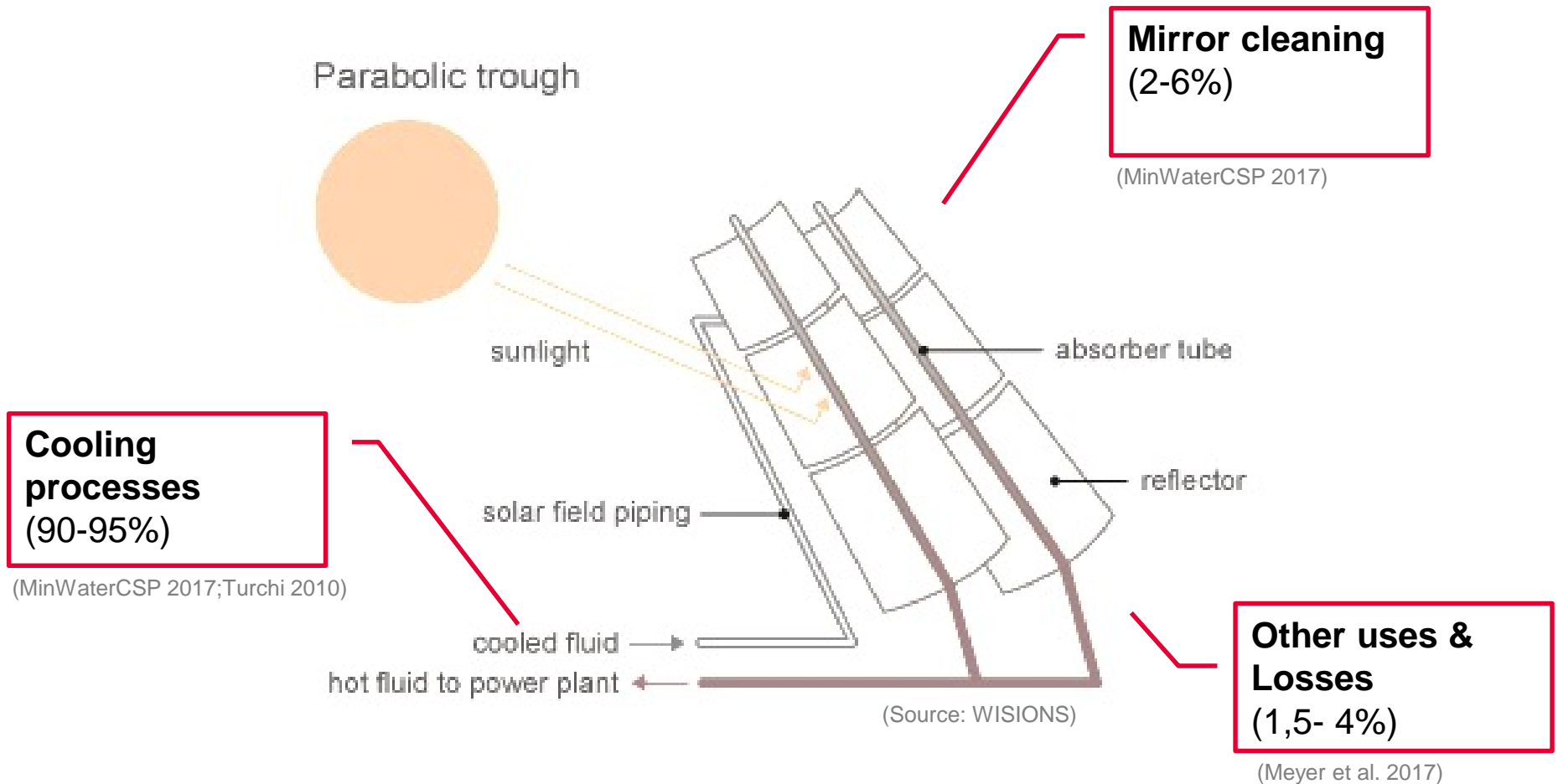
Water Concentrated Solar Power (CSP)

Average water demand of CSP power plants with water cooling (%)



Concentrated Solar Power (CSP)

Average water demand of CSP power plants with water cooling (%)



CSP Plant: Noor₁ Morocco

Case study

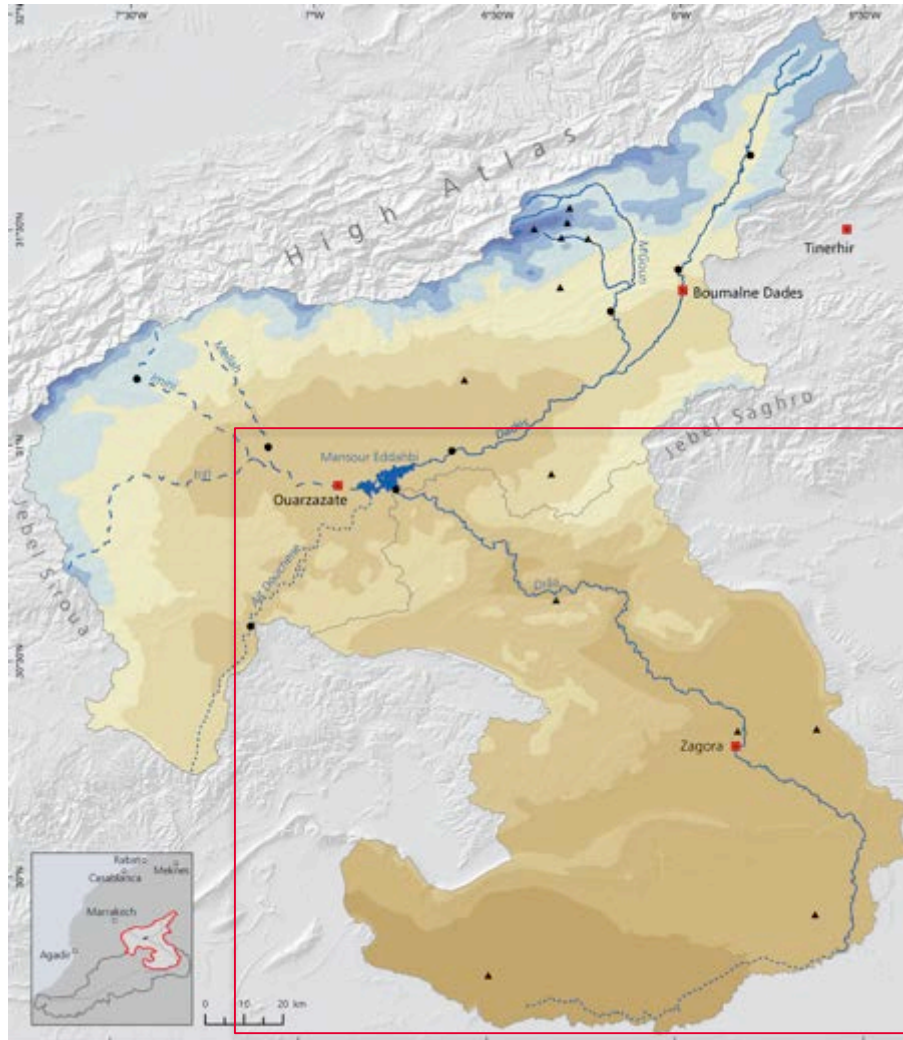


(Picture Source: own picture)

Case Study Concentrated Solar Power (CSP)

Geographic scope

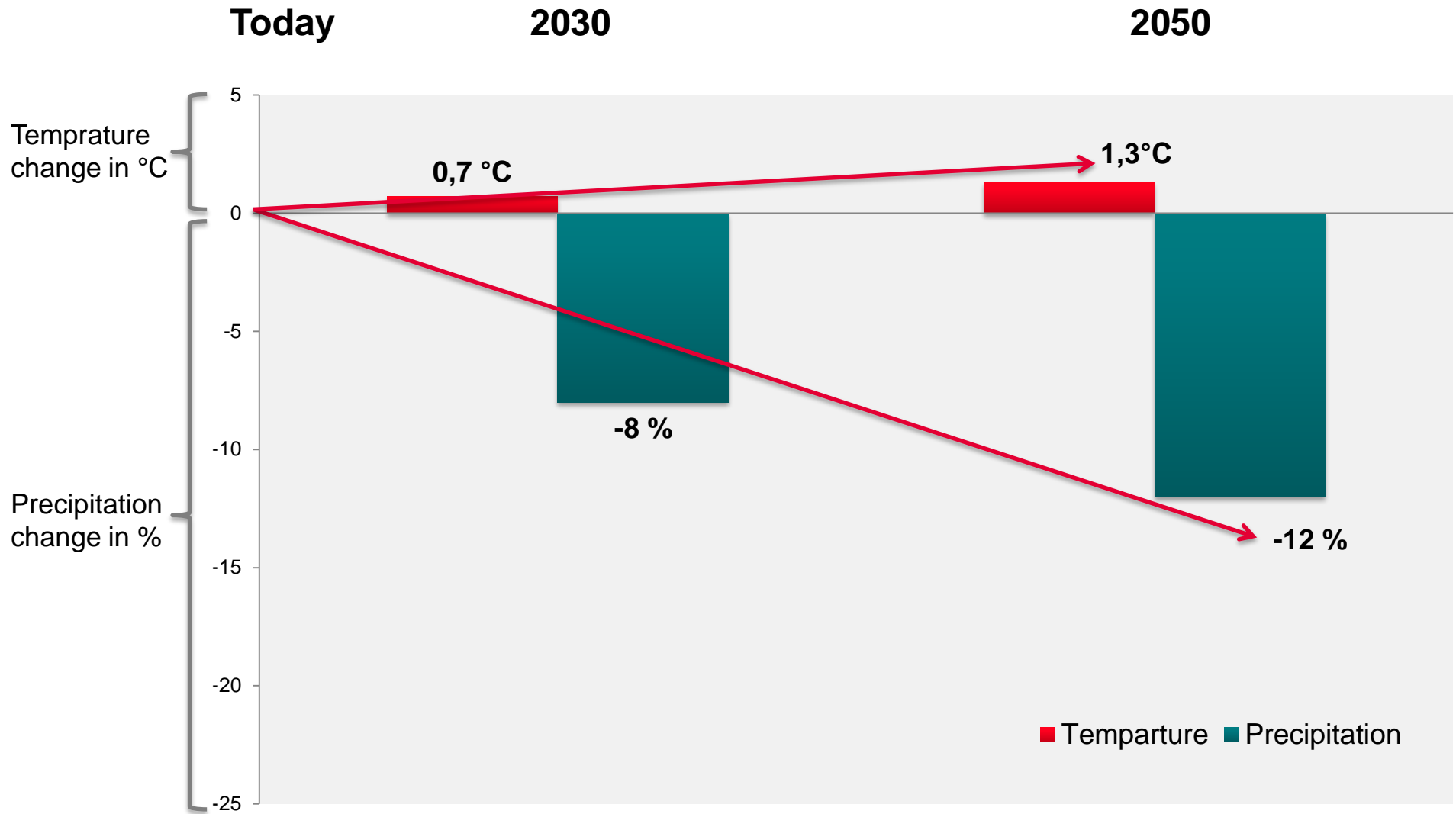
➤ Middle Drâa valley



(Source: Schulz 2008)

Water supply scenarios

Climate change scenarios temperature and precipitation trends

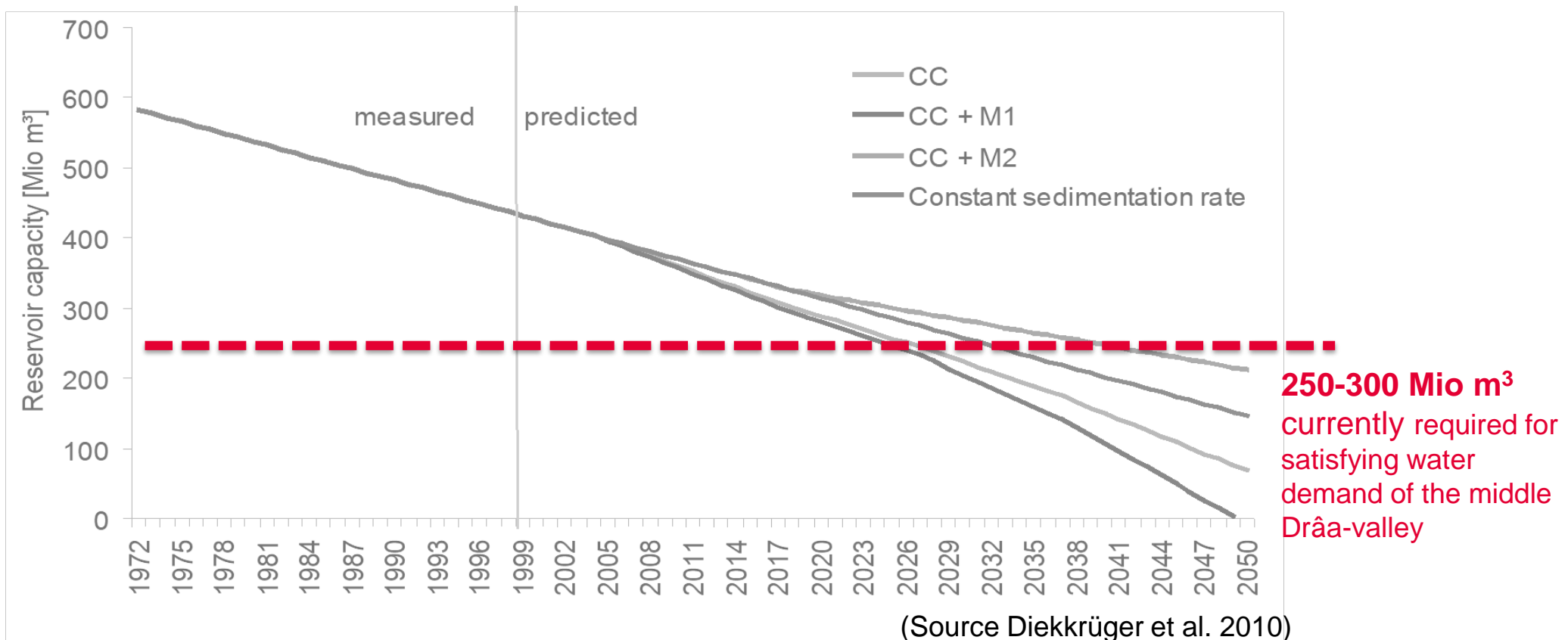


Temperature and precipitation trends from climate model REMO compared to baseline 1978-2007

(Source: Busche 2012)

Water supply scenarios

Reservoir capacity “Mansour Eddahbi” under climate change scenarios



Simulated development of the capacity of the reservoir “Mansour Eddahbi”

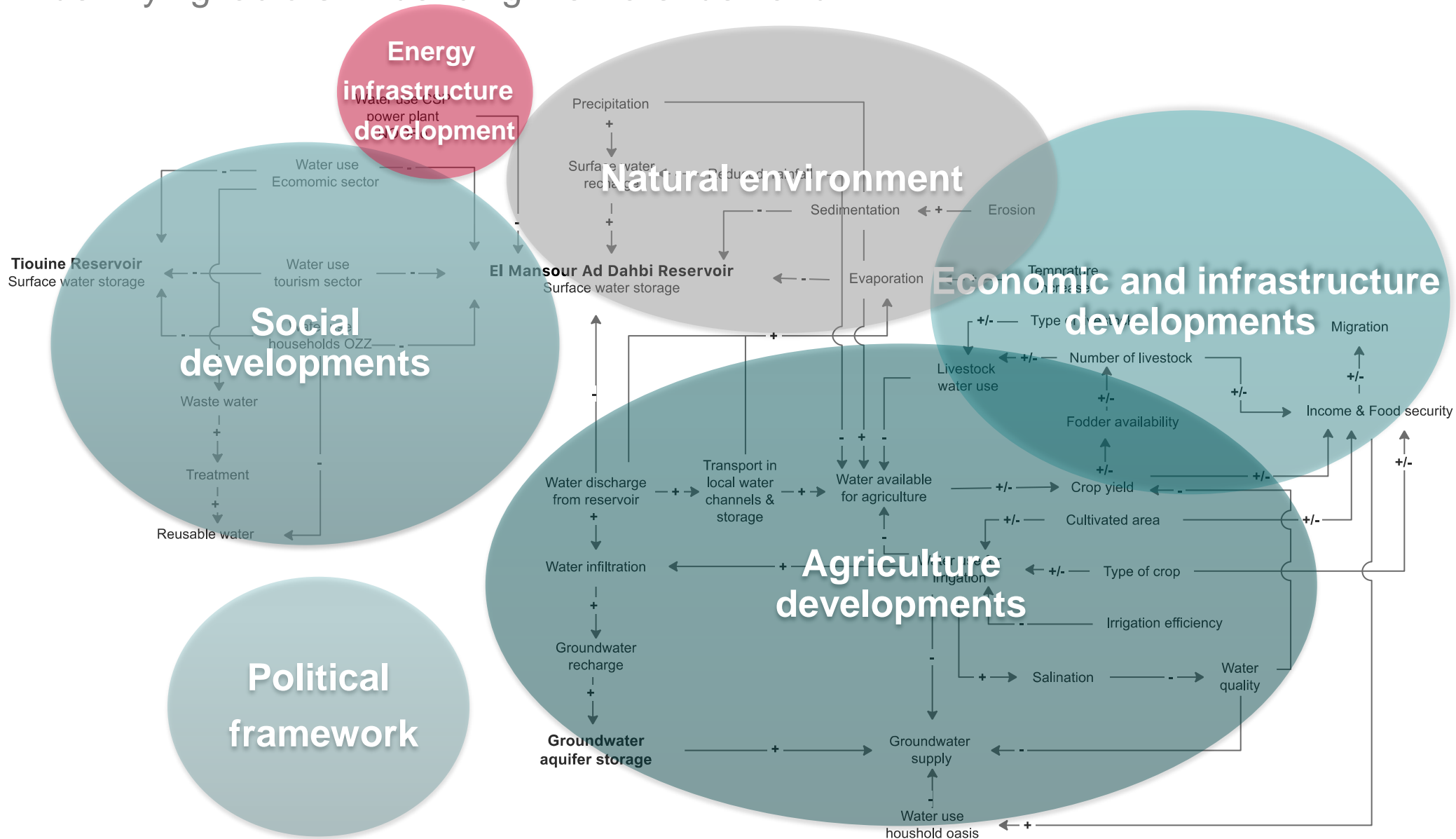
How to operationalize the WEF Nexus?

Nexus assessment approach assess future developments

- 1. Mapping the links between the water, food and energy sector based on a qualitative analysis**

Mapping the WEF-Nexus links

Identifying factors influencing the water demand



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Identifying critical links

Overview links influencing the water demand and use

Agriculture developments

- › Cultivated area
- › Choice of crop types
- › Irrigation with groundwater
- › Irrigation efficiency
- › Livestock numbers
- › Water quality

Social developments

- › Population development (oasis/towns)
- › Lifestyle developments
- › Food production

Economic & infrastructure developments

- › Tourism sector development
- › Industry sector development
- › Economic development
- › Transport infrastructure development

Policy framework

- › Subsidies and support programs

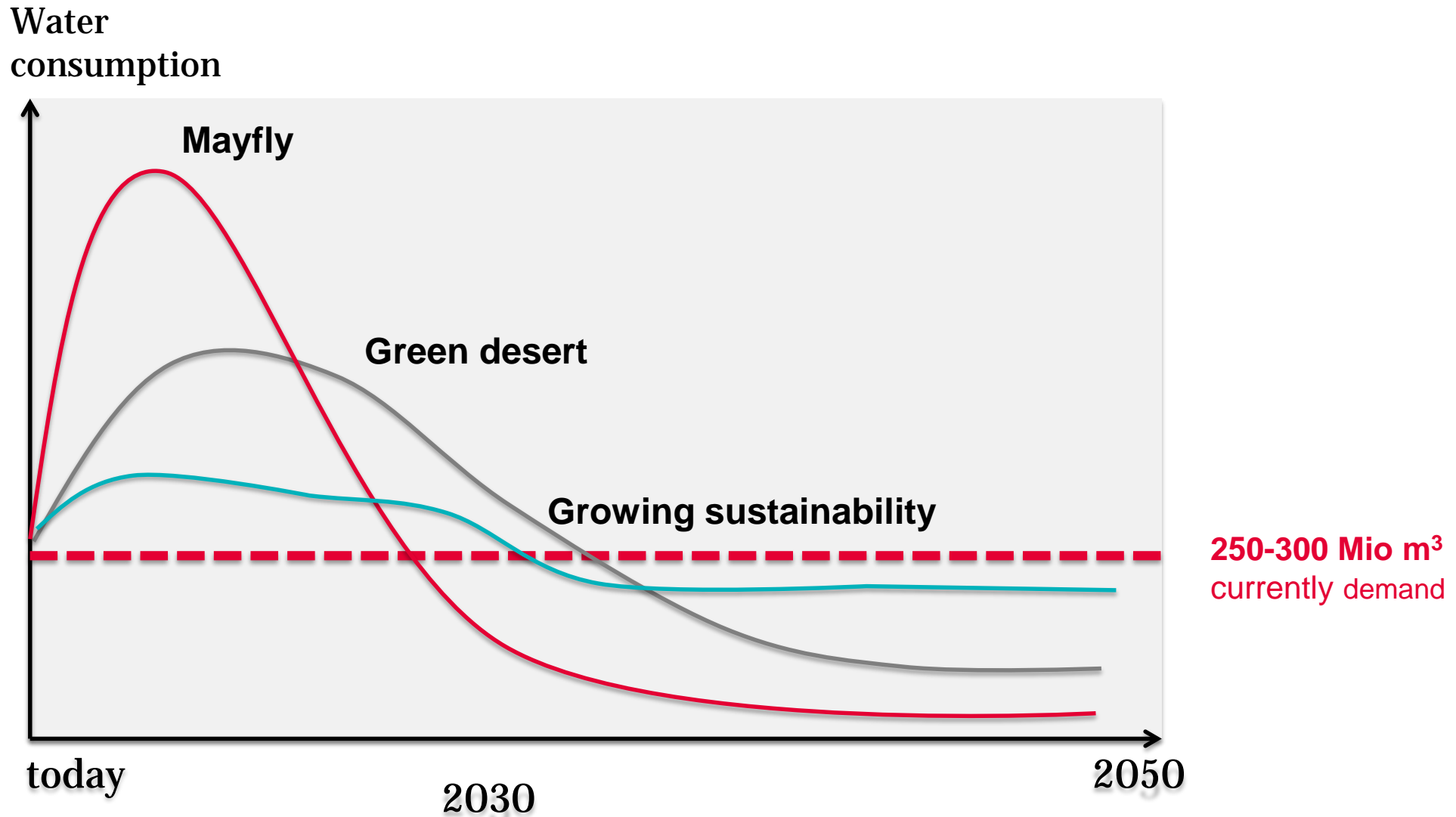
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Developing scenario narratives

Preliminary results



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**Thank you very much
for your attention!**

For further information, please visit

www.wupperinst.org

<http://wandel.cesr.de/de>