SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

SOLARCOOLING® SUNBELT REGIONS TASK65

Solar Cooling for the Sunbelt Regions

First results of Task 65 Activity A1
Climatic conditions and applications

4th International Conference on Solar Technologies & Hybrid Mini Grids
to improve energy access (s-@ccess 2023)
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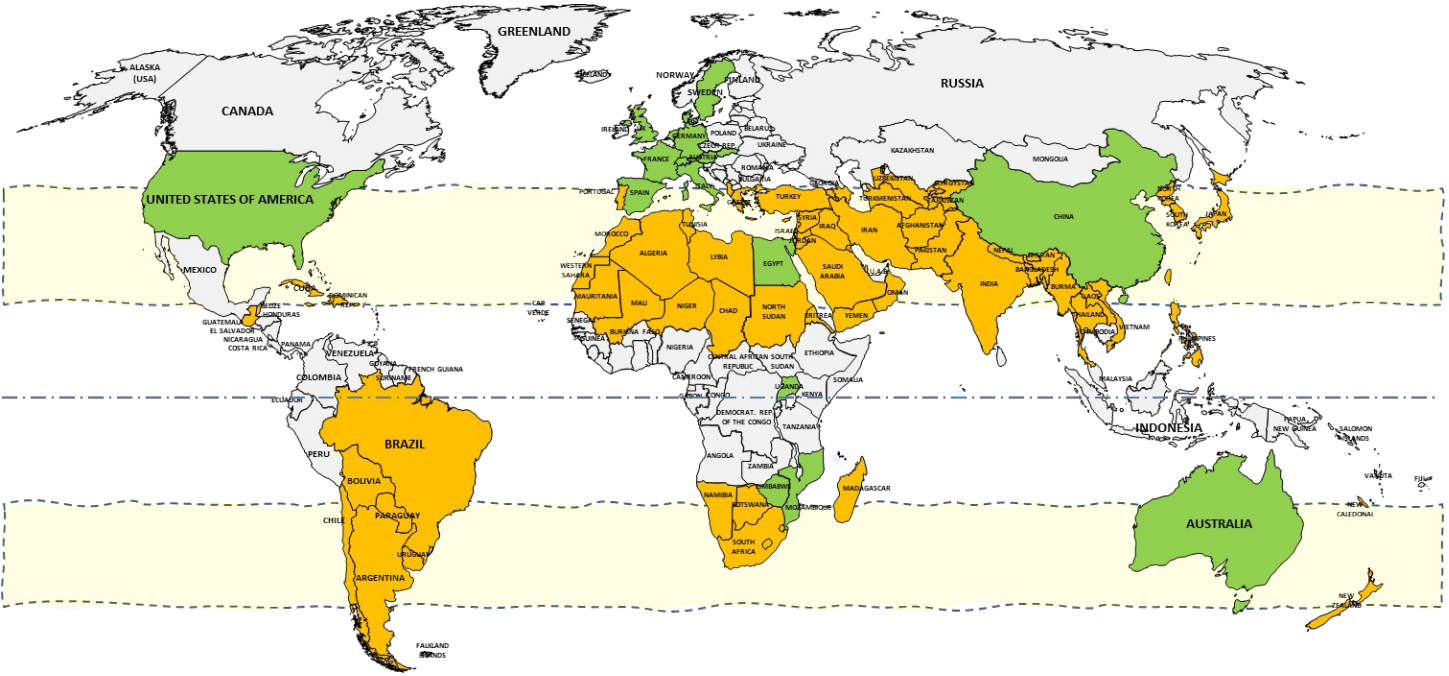
IEA SHC Task 65
Solar Cooling for the Sunbelt Regions



Collaborative Research

- 82 Experts
- 18 Countries
- 23 Companies
- 23 Institutes

Endorsed by IC7

https://task65.iea-shc.org

IEA SHC Task 65 objective & scope

Objective

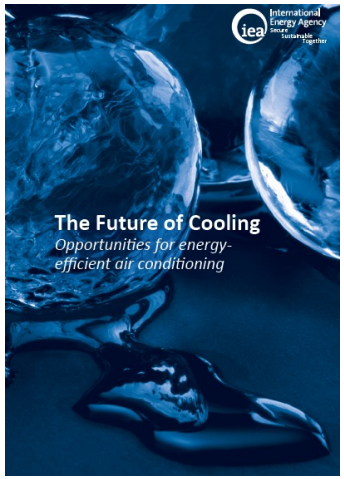
- Focus on innovations for **affordable, safe and reliable solar cooling systems for the Sunbelt regions worldwide**
- Implementation/adaptation of components and systems for the different boundary conditions is **forced by cooperation with industry** and with support of target countries like India/UAE through Mission Innovation IC7
- The innovation driver and the **keyword is adaptation** of existing concepts/technologies to the sunbelt regions using solar energy either solar thermal (ST) or solar PV

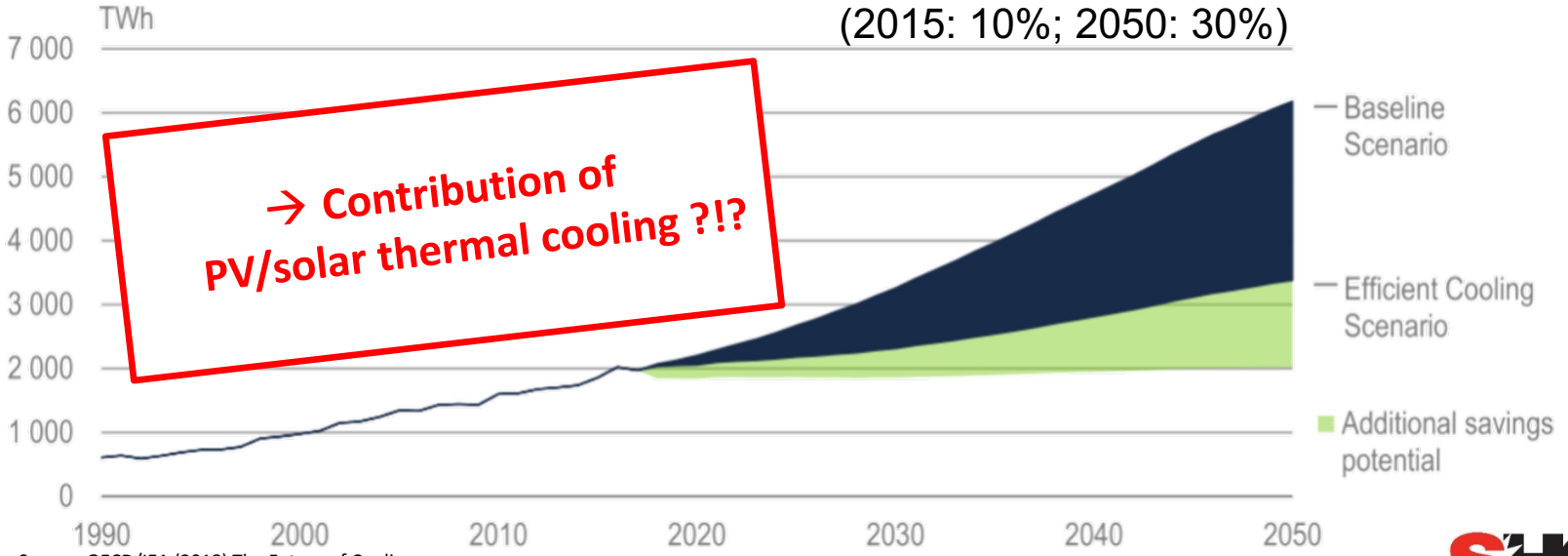
Scope

- Build on previous tasks 25, 38, 48 and 53
- **Target size segment** on cooling and air conditioning between **2 kW and 5,000 kW** (PV and ST)
- Task duration: July 2020 – June 2024

What are the challenges?

- The current trend shows, that **energy needs for space cooling** – almost entirely in the form of electricity – will **more than triple between 2016 and 2050,** driven mainly by the residential sector (2,000 TWh => 6,000 TWh)
- Most of the **projected growth in energy use for cooling is set to come from India, China and other emerging economies**
- Space cooling is set to overtake appliances and plug loads **to become the single largest user of electricity in buildings** (2015: 10%; 2050: 30%)



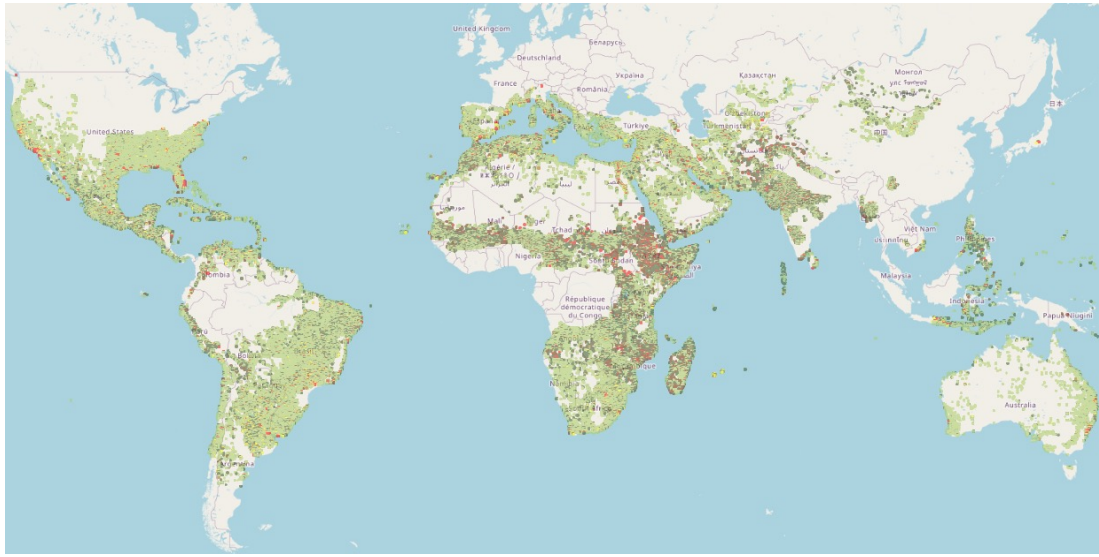


Source: OECD/IEA (2018) The Future of Cooling

Subtask A: Adaptation

A1 Climatic conditions & applications

- **Geographic Information System (GIS) has been used to process climatic conditions and typical applications data such as**
  - Geographic areas between 40°N and 40°S latitude
  - Solar direct normal irradiance
  - Population density/Built-up areas/ Settlement levels (SMOD)
  - Climate zones (Köppen–Geiger climate classification system)

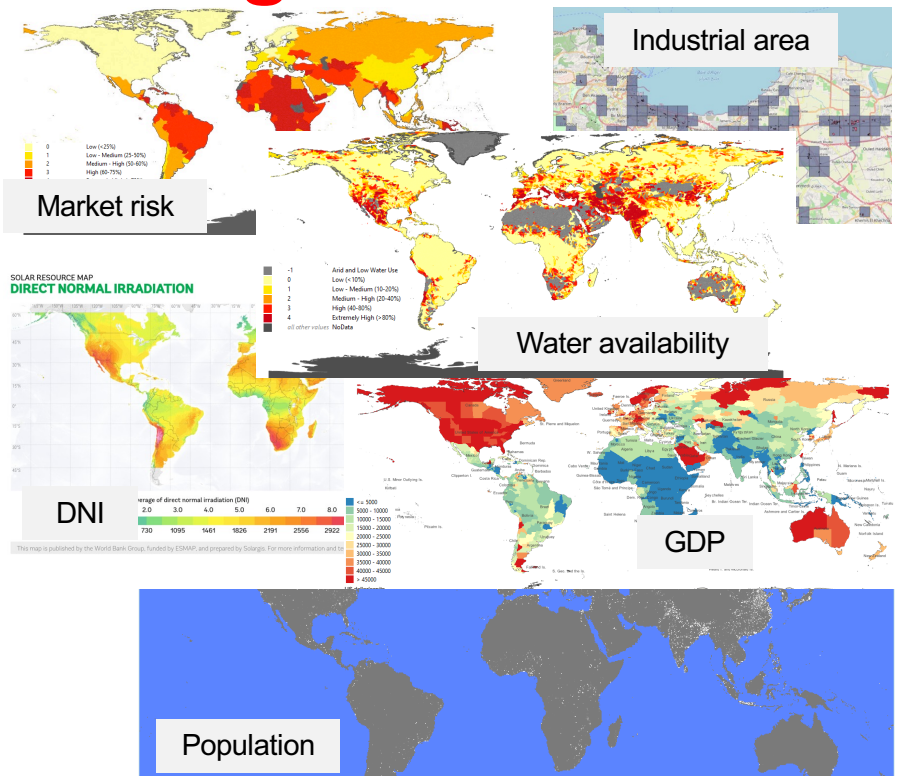


- **SunBeltChiller project**
  Relevance and market potential estimation (draft)
  (DNI > 1,500 kWh/m²a, SMOD 13…30, potentially suitable climate zones)

Use of a GIS to determine boundary conditions for solar cooling

Method (using Geographic Information System Software QGIS):

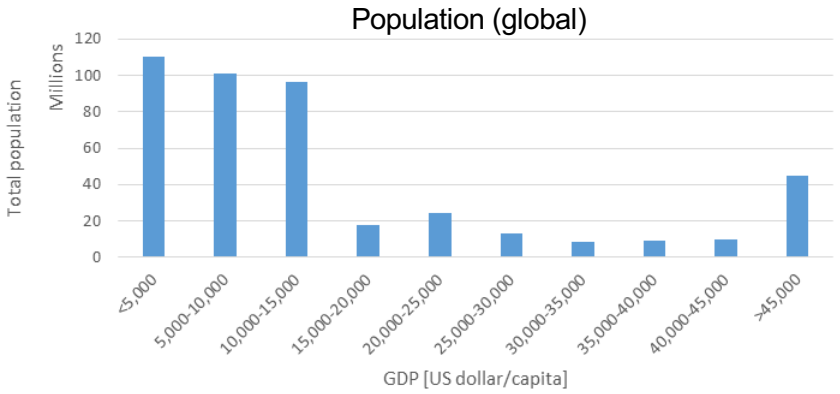
1. Collecting solar cooling specific geographic data from different sources
   - Climate zones (Köppen–Geiger climate classification system)
   - Various solar irradiances (DNI, GHI, DIF) and photovoltaic power potential (PVOUT)
   - Population density/Settlement levels
   - Industrial area
   - Water availability
   - Market risk (RRI) covered by Environmental Social Governance (ESG)
   - Purchasing Power Parity / Gross Domestic Product (GDP)
2. Adaptation of data to uniform grid structure
3. Defining data filter and Combining data
4. Numerical und graphical presentation of the results

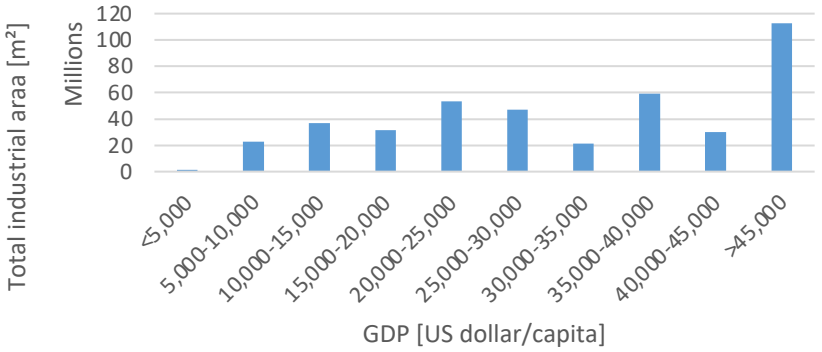


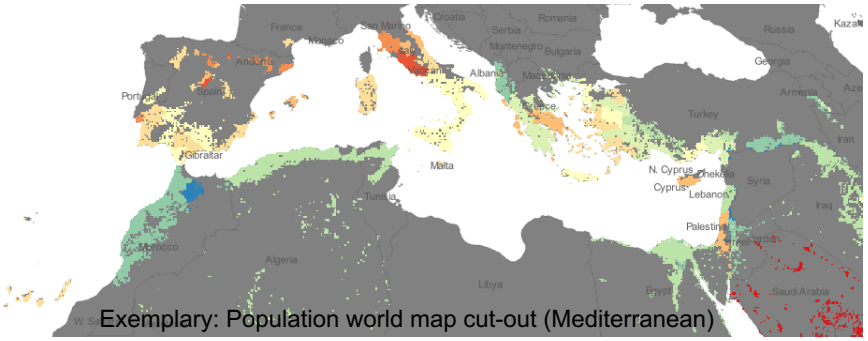
The developed method can be used to analyze general boundary conditions for cooling systems and to **analyze specific potentials by choosing/ defining appropriate filter**

Source: ZAE Bayern

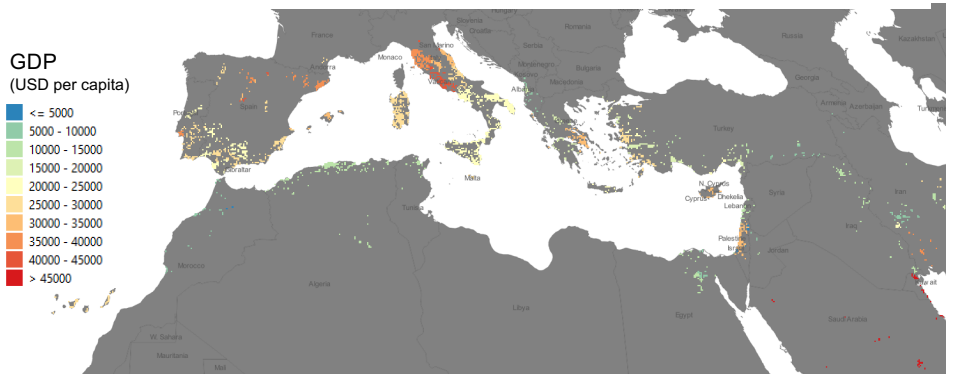
Results of the system specific potential analysis for the SunBeltChiller







Exemplary: Population world map cut-out (Mediterranean)



Source: ZAE Bayern

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