Third Update on Activity C1 Design Tools and Models, Task 65 Solar Cooling Sunbelt Regions




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Acknowledgements

We recognise the importance of our relationship to the traditional owners of the land. I pay my respects to the traditional custodians of the land and extend that respect to other indigenous people.

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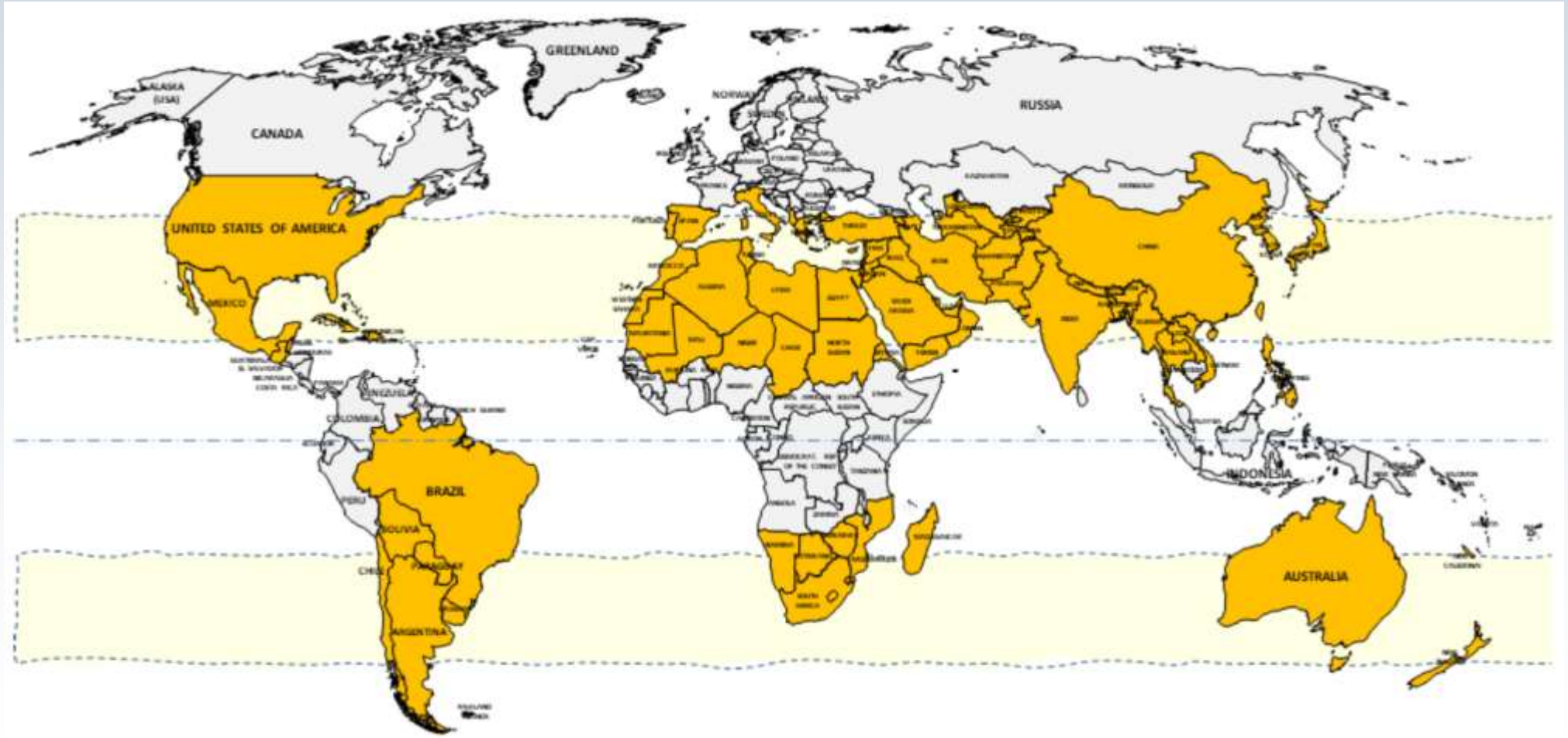
Mr Ken Guthrie AM, Director, Sustainable Energy Transformation
Associate Professor Rebecca Yang, Chair APSRC 2023, RMIT University

IEA SHC Task 65 Solar Cooling Sunbelt Regions

https://task65.iea-shc.org/

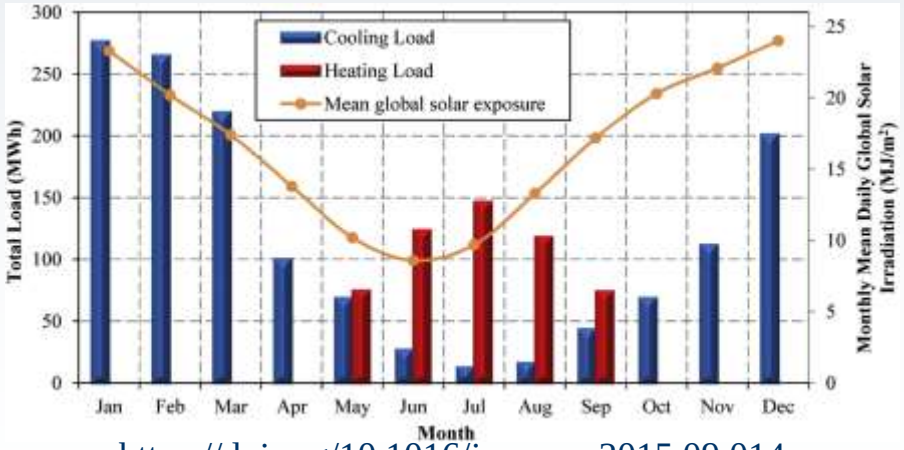
The main aim of the global IEA Solar Heating and Cooling research platform Task 65: Solar Cooling for the Sunbelt Regions (July 2020 – June 2024) is development of innovations for affordable, safe and reliable cooling systems for sunbelt regions worldwide (Jakob, 2020).

Sunbelt Regions



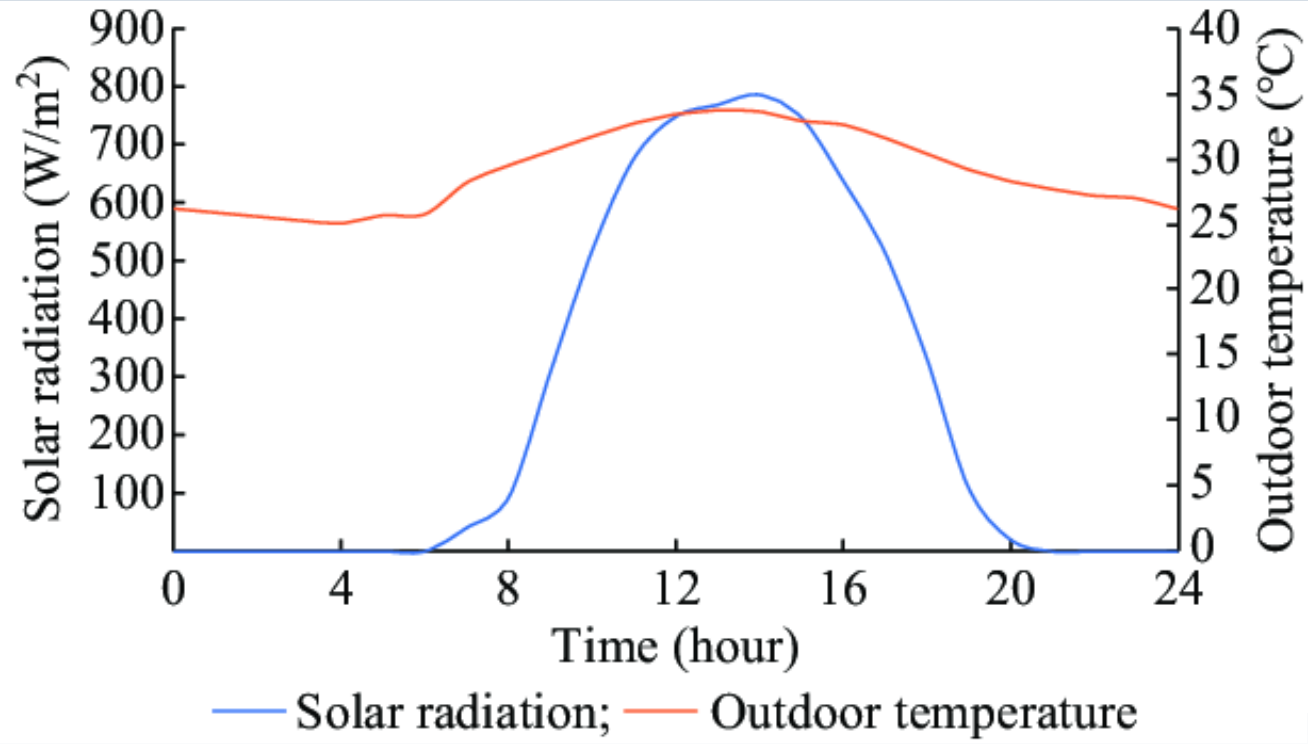
Why Solar Cooling

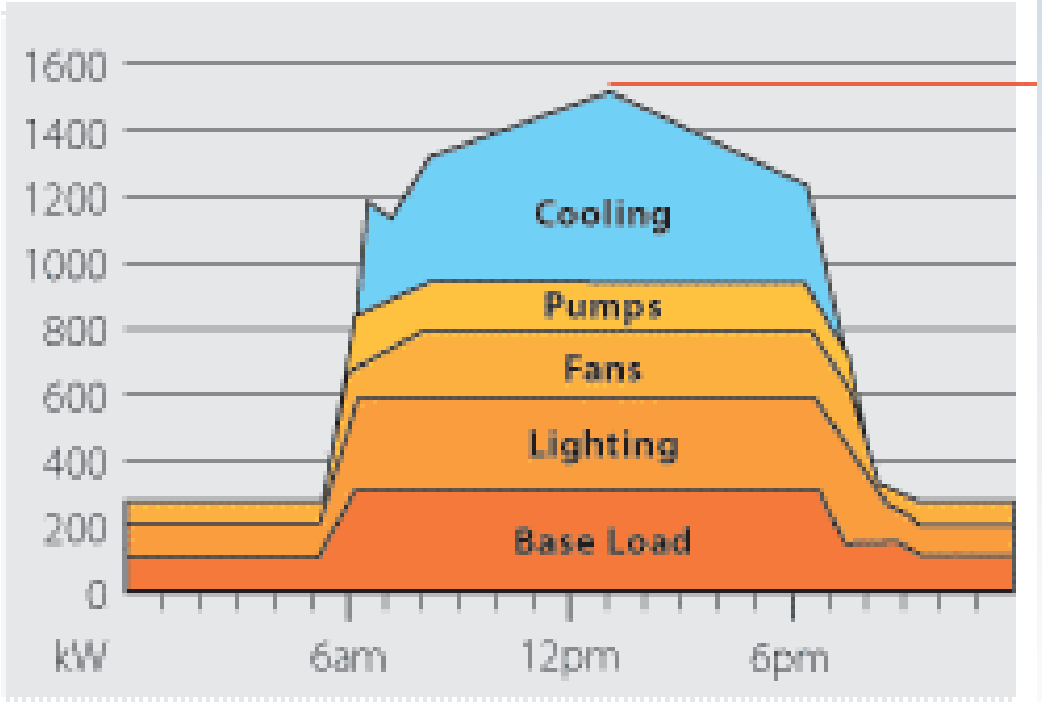
- A sunny climate ⇒ high building cooling demand.
- Solar cooling ⇐ high potential to meet the high cooling demand.
- Excellent match between solar energy availability and cooling demand.
- Solar pathways to cooling
  - solar thermal
  - solar photovoltaic



https://doi.org/10.1016/j.renene.2015.09.014

A typical solar radiation availability and office building load





(https://www.researchgate.net/profile/Yanhong-Luo-2/publication/340231192/figure/fig1/AS:874009671499778@1585391552221/Solar-radiation-and-temperature-on-a-typical-day-in-summer.png & https://energywatch-inc.com/wp-content/uploads/2017/06/Pic1.png)

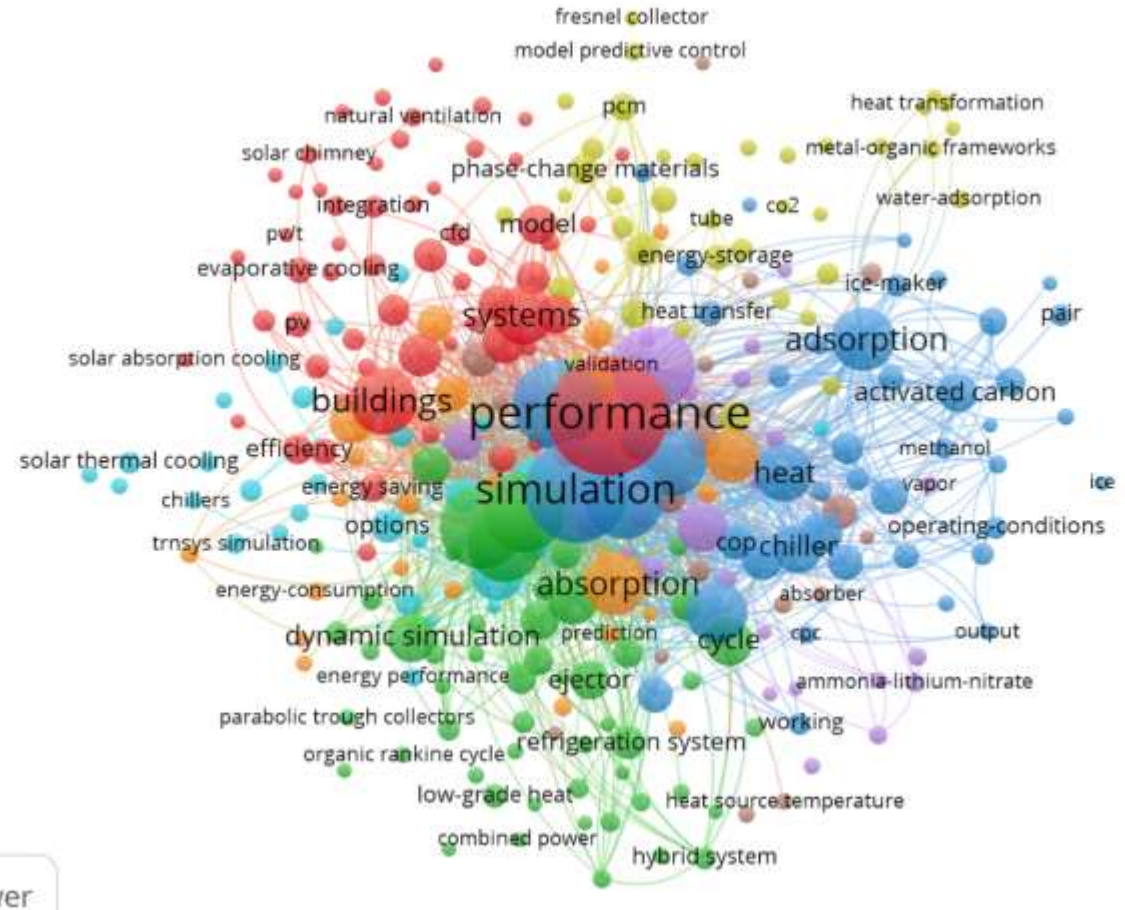
Subtask C: Assessment and Tools General Objectives:

- Update/merging of useful tools for design & assessment,
- Establishing/adapting of assessment method and benchmarking (incl. reference system in different locations),
- Create common database for technical, environmental and economic assessment for the participating countries,
- Analyses of Subtask B results and benchmarking against reference systems and different renewable and solar solutions,
- Sensitivity analyses of high influencing parameters on the technical/economic/environmental assessment.

Literature review: WoS search

ALL=("solar cooling" OR "solar refrigeration") 1990-2021⇒1216 articles

keyword co-occurrence analysis

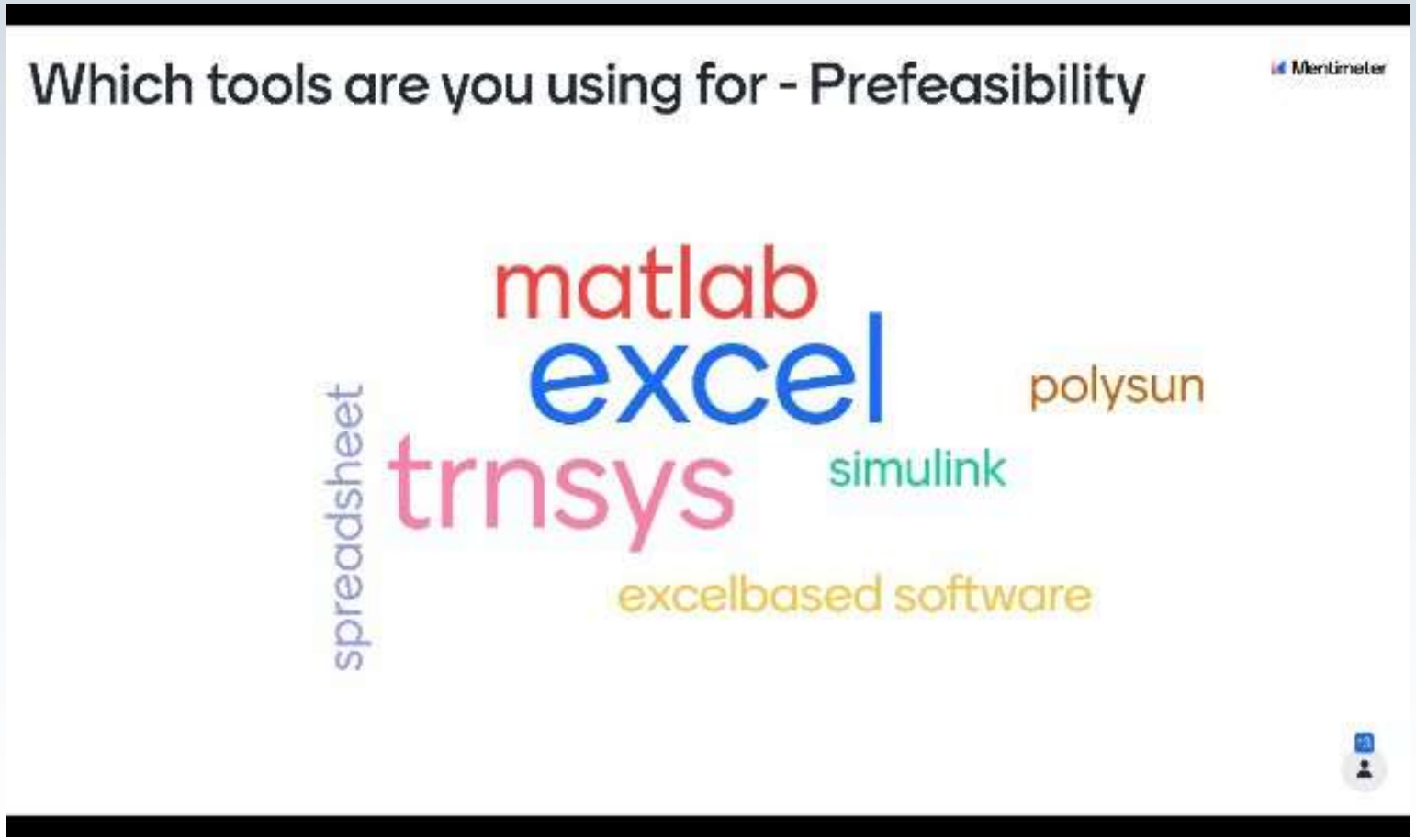


- Minimun = 5 occurrence
- 'Model' clustered with 'performance' and 'systems' linked with 'simulation'.
- 'Trnsys simulation' is the only tool appeared.

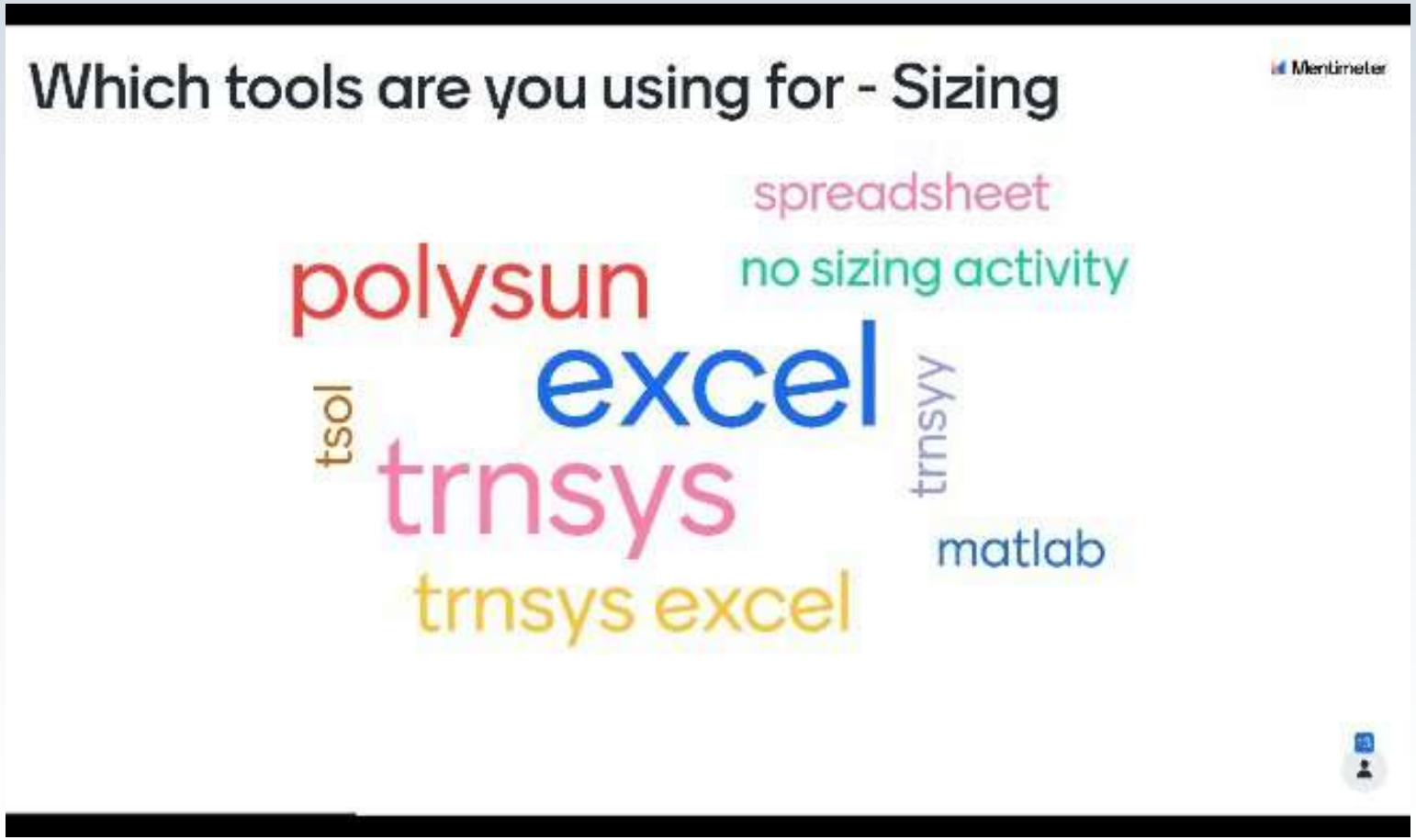
Interviews/Questionnaires

Component→	Solar collector				Cooling technology					Delivery			Storage	
Design stage or output ↓	Flat plate	Evacuated tube	Trough	PV PV/T	Absorption	Adsorption	Liquid desiccant	Solid desiccant	Vapour compression	Air	Liquid	Electricity	Heat (cold)	Battery
Prefeasibility	Metonorm + Excel Tool Phyton	Metonorm + Excel Tool Phyton		Metonorm + Excel Tool	MATLAB EES Excel Tool	Phyton			MATLAB EES Excel Tool	x	x	x	MATLAB TRNSYS Excel Tool Phyton	
Sizing	Metonorm + Excel Tool	Metonorm + Excel Tool		Metonorm + Excel Tool	MATLAB EES TRNSYS Excel Tool				MATLAB EES TRNSYS Excel Tool			x	MATLAB TRNSYS Excel Tool	
Technical performance	Metonorm + Excel Tool	Metonorm + Excel Tool		Metonorm + Excel Tool	MATLAB EES TRNSYS Excel Tool				MATLAB EES TRNSYS Excel Tool				MATLAB TRNSYS Excel Tool	
Financial performance	Excel Tool	Excel Tool		Excel Tool	MATLAB EES TRNSYS Excel Tool				MATLAB EES TRNSYS Excel Tool				MATLAB TRNSYS Excel Tool	
Hourly simulation	MATLAB TRNSYS Metonorm + Excel Tool	MATLAB TRNSYS Metonorm + Excel Tool	MATLAB	Metonorm + Excel Tool	MATLAB EES TRNSYS Excel Tool	-	-	ENERGYPLUS	MATLAB EES TRNSYS Excel Tool	-	-	-	MATLAB TRNSYS Excel Tool	-

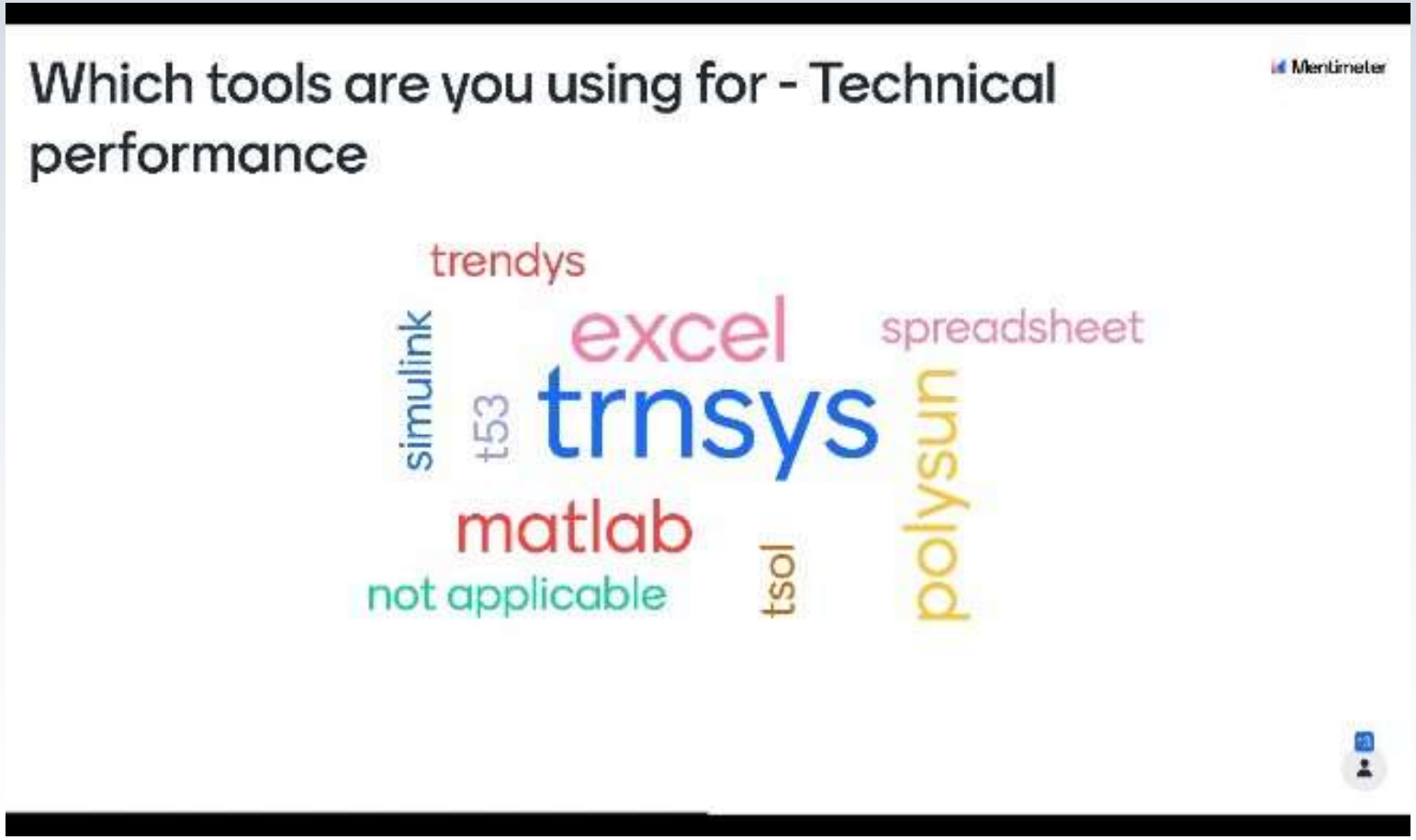
Prefeasibility analyses



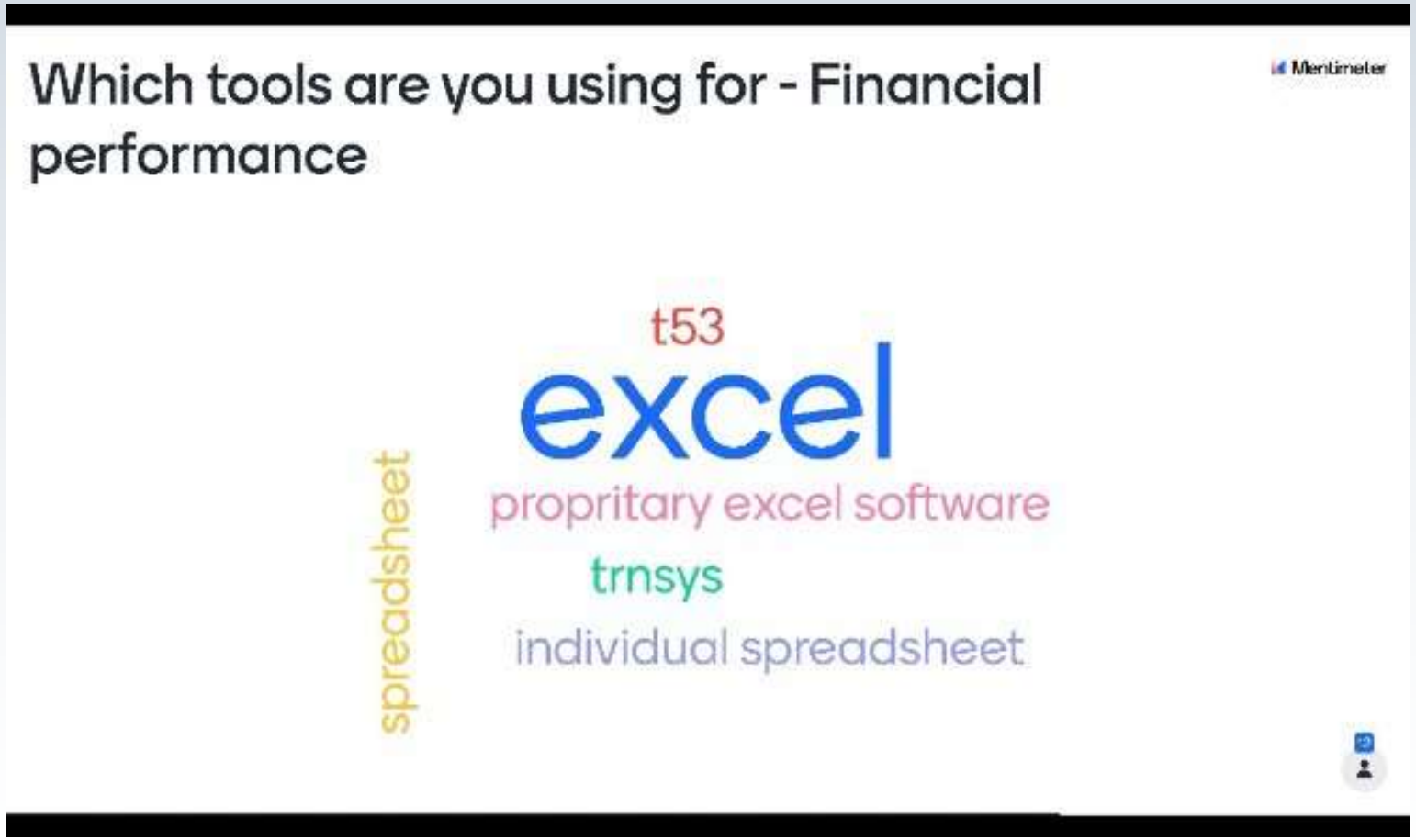
Component sizing



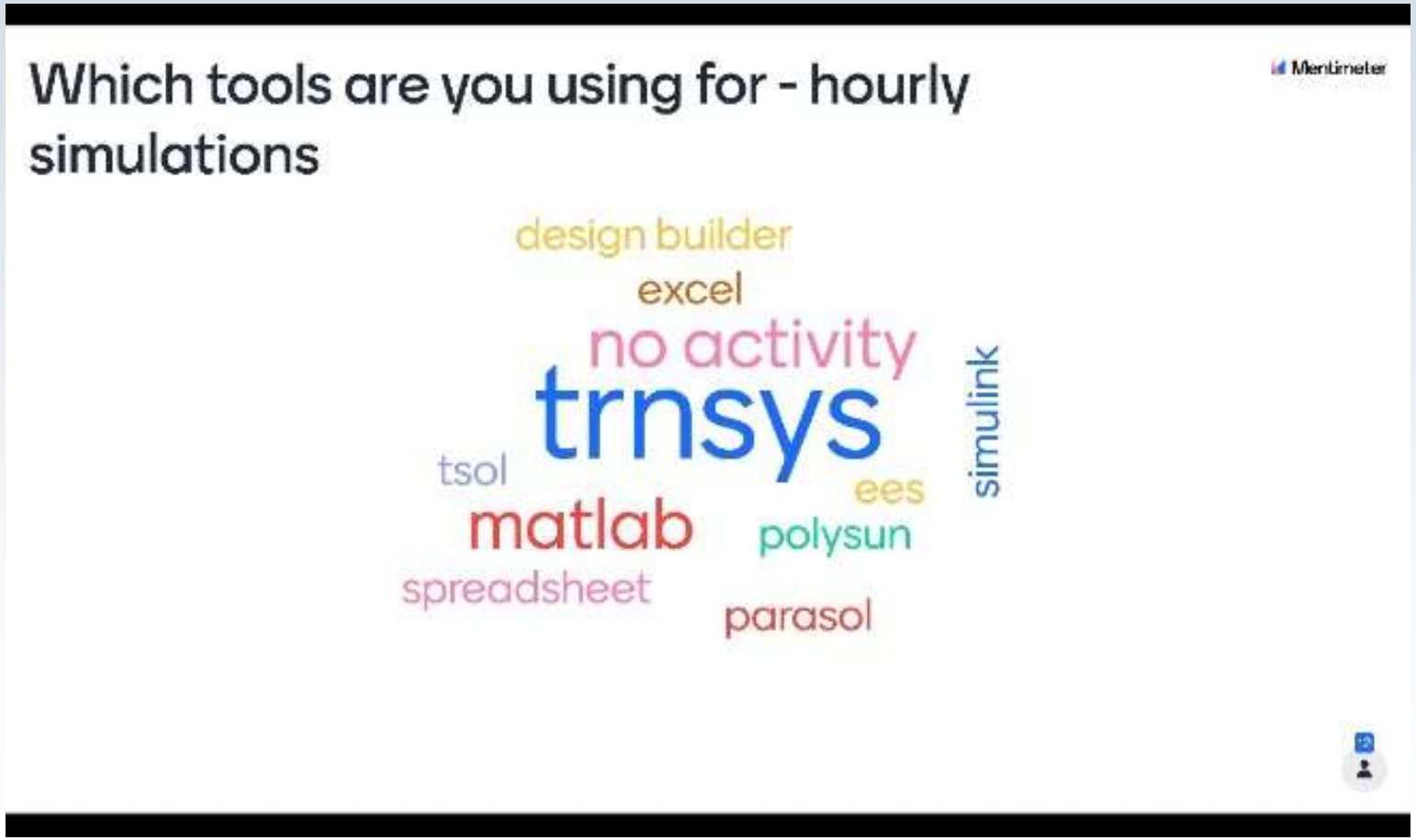
Technical performance



Financial analyses

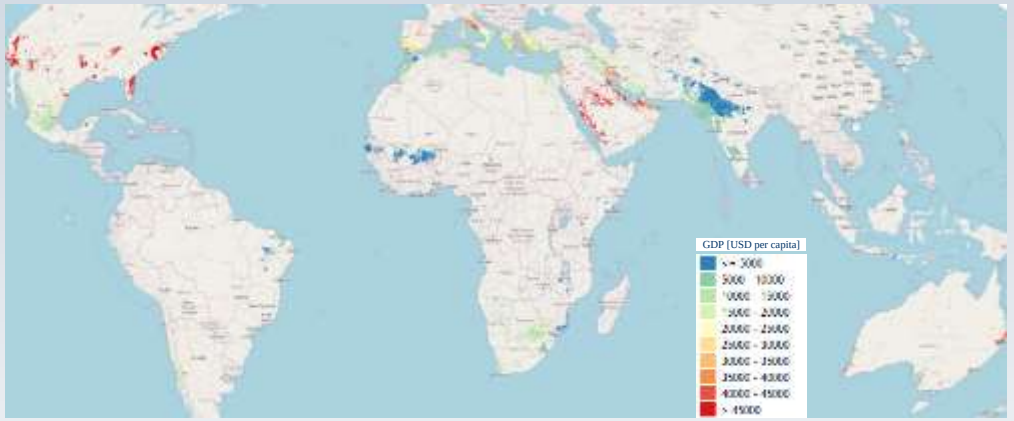


Hourly simulations



Solar Cooling for Emerging Economies proposal

Source: ZAE Bayern



- Solar cooling for industrial applications
- Thermal energy storage
- Industrial waste heat recovery

… to demonstrate the potential for sustainable and efficient heating/cooling solutions as a system approach.

1 year preparation phase
(2x meetings)

4 year duration
(July 2024-June 2028)

Many thanks!

The End.

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