



**GEOHERMICA Initiative & CETPartnership TRI4  
Workshop in Dublin 10/10/2023**

# **Opportunities for Low-medium T° Geothermal Energy in the Energy Transition in Europe**

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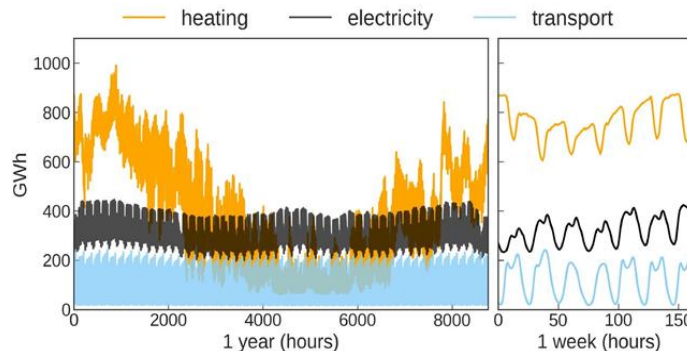
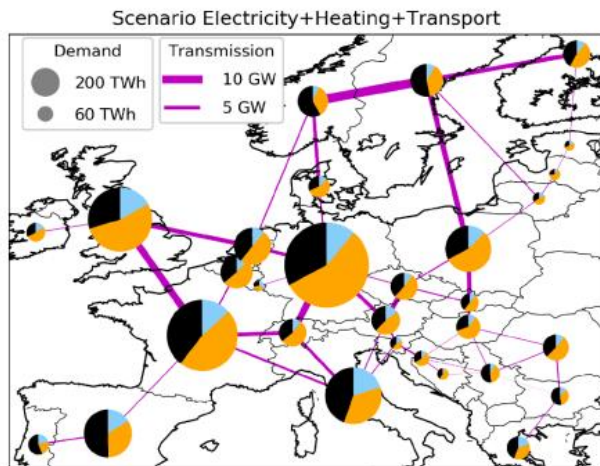
# Heating and cooling in Europe

Heating is 50%!

Space heating, and for industry

Heat demand peaks in winter

Winter 2022-23 showed the urgency ...



Source: M. Victoria, K. Zhu, et al, Energy Conversion and Management 201 (2019) 111977

# Aims for today

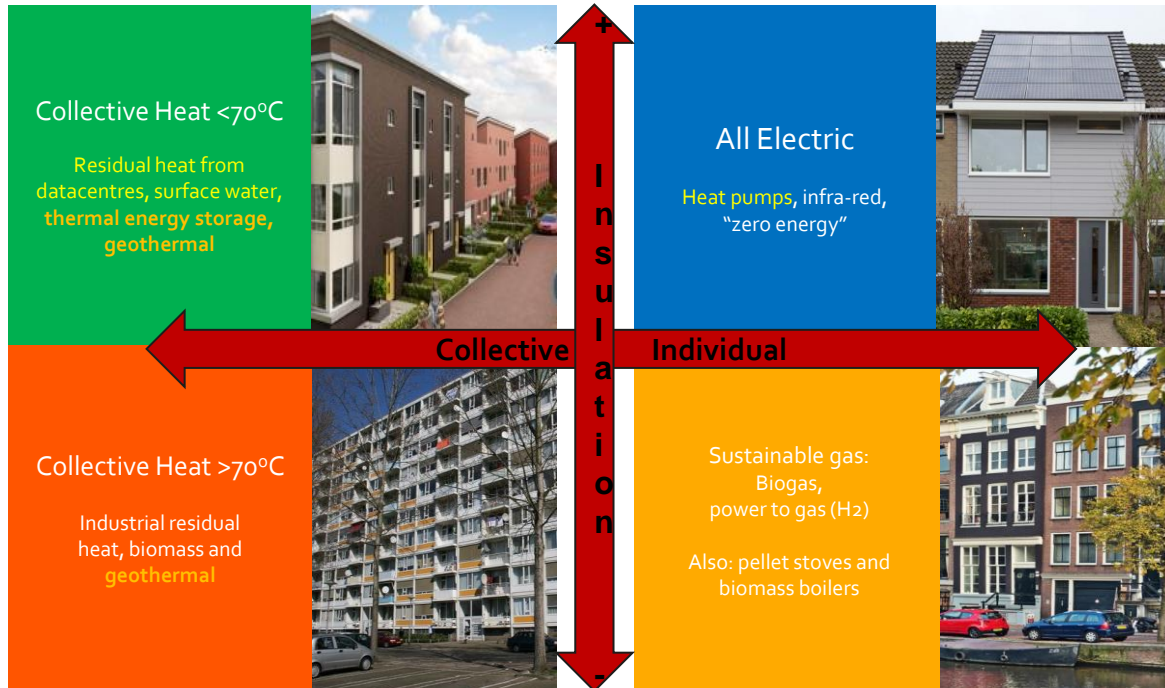
- Collective systems for cities and campuses
- All subsurface use, deep, shallow, everything in between - and other sources of low-medium temperature heat
- Inspire – broad range of concepts
- Learn
  - Real projects from different countries
  - Benefits, challenges, added value
- GEOHERMICA Initiative - Exchange across country borders
- ‘Scope’ for the CETPartnership 2024 Call text

# Space heating – and cooling

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# Alternatives for heating with fossil fuels

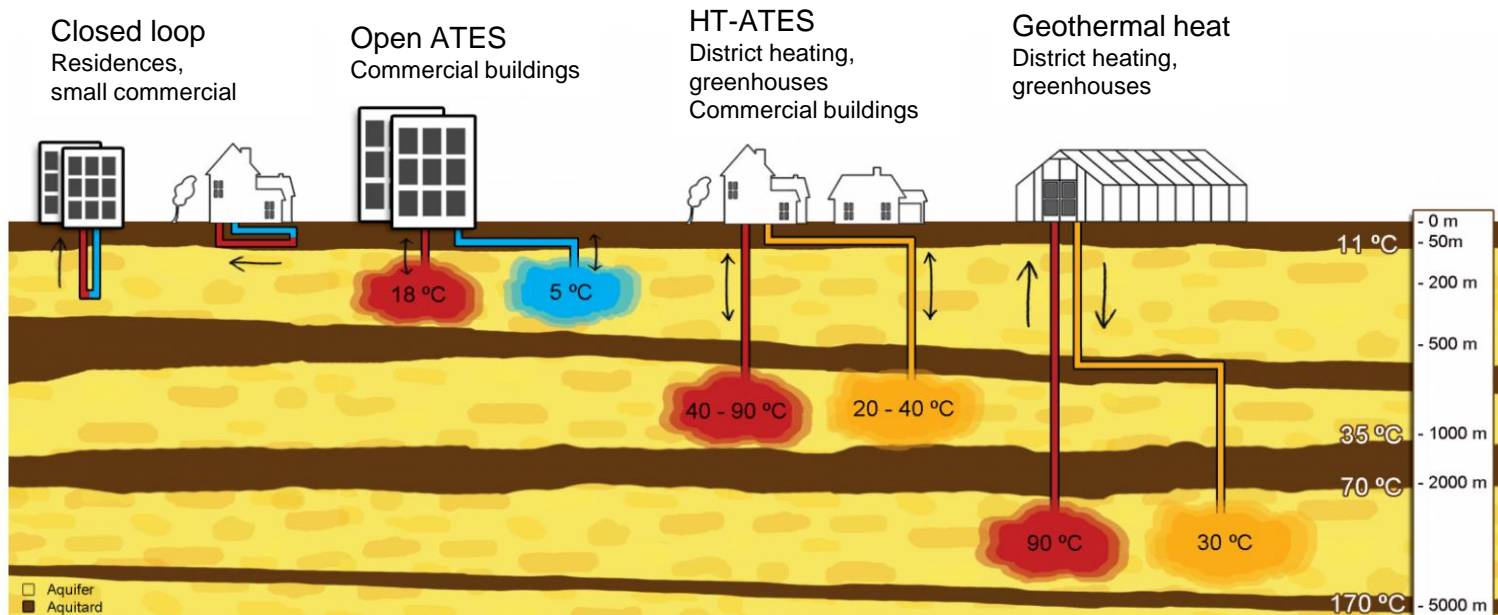
Geo-thermal energy including geo-thermal energy storage as a source for district heating



Graphics courtesy Paul Ramsak

Switch from high temperature to low temperature (district heating) systems

# Various concepts

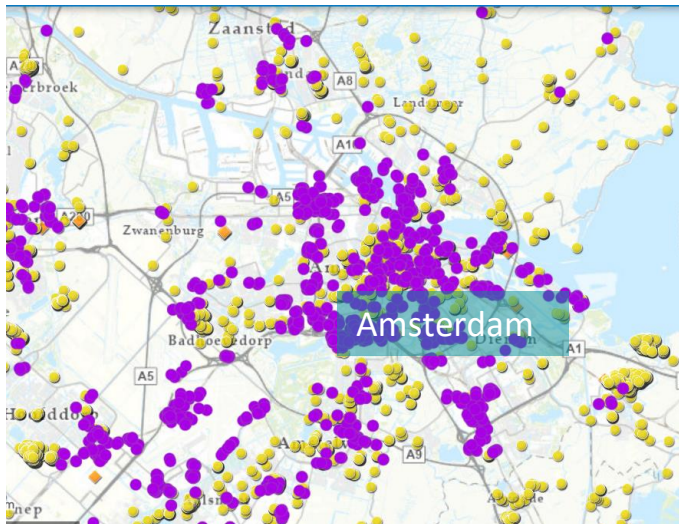


Bodemenergie - geothermie

Source: <https://www.daarkrijgjeenergievan.nl/energiebronnen/bodemenergie/>

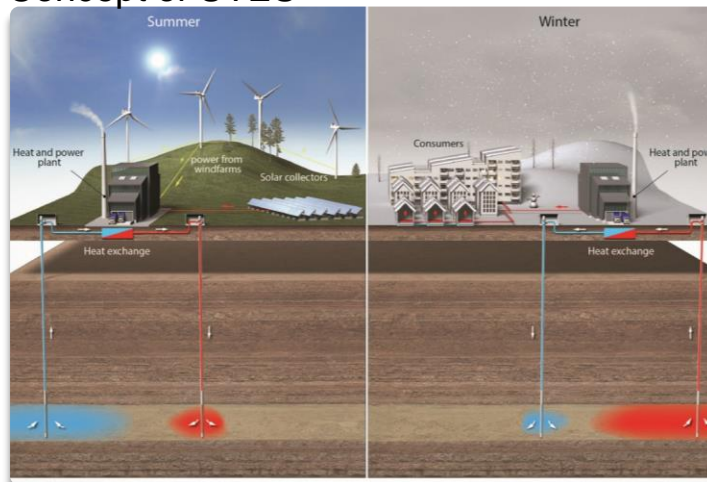
# Underground thermal energy storage

Bridging winter and/or summer peaks  
Open (purple) and closed (yellow) UTES systems widespread in the Netherlands



HT-ATES Middenmeer, Netherlands: 7,5 MWh<sub>th</sub>  
Geothermal heat

## Concept of UTES

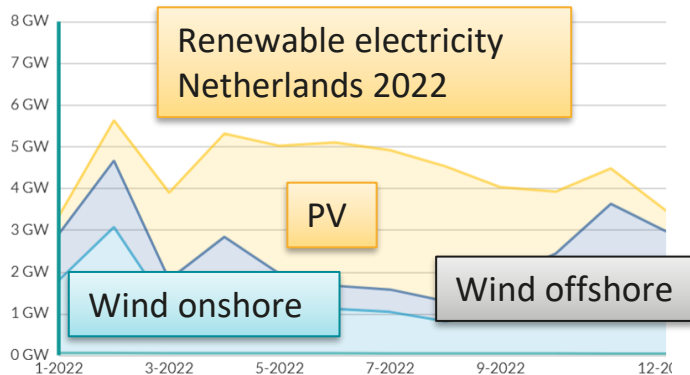


Graphic courtesy HEATSTORE [www.heatstore.eu](http://www.heatstore.eu)

<https://wkotool.nl/>

# Seasonally alternating heating and cooling

Mostly using shallower subsurface  
 Many examples in Europe, ATES and BTES  
 ‘Dual use’ helps economic feasibility  
 Various concepts, using local conditions



Renewable power production may well peak in summer  
 What will be the winter electricity and renewable fuel prices? H<sub>2</sub>? Methanol?  
 → ‘Local for local’ renewable heat makes sense



# Lower depths?

NL Feed in premium geothermal ('22)

D (m)	T (°C)	h/year	€/kWh <sub>th</sub>
500-1500	25-55	3500	0,15
500-1500	25-55	6000	0,096
1500-4000	70-75	3500	0,12
1500-4000	70-75	5000	0,097
1500-4000	70-75	6000	0,053*

\*medium productivity 12-20 MW

Source: [Eindadvies basisbedragen SDE++ 2023 \(pbl.nl\)](https://pbl.nl)

Reality will have upsides:  
based on very few cases &  
'standard' subsurface conditions

- Lower up-front investment
- Suitable subsurface conditions more often found
- Smaller networks
- Rising insulation standards
- Combine with other LT sources

Innovation welcome!

- E.g. bespoke drilling equipment

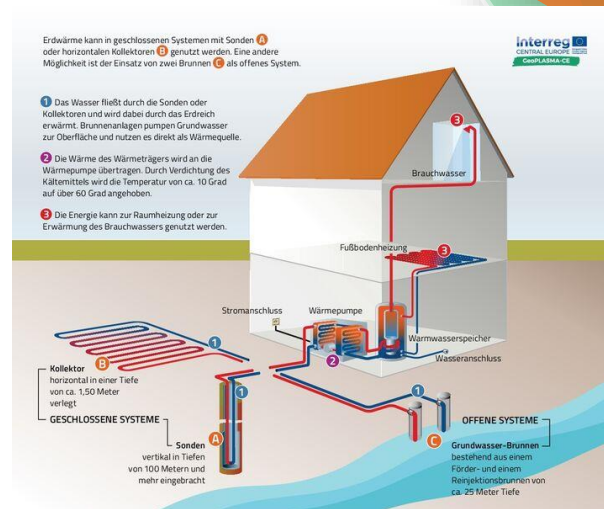
horticulture

# Geothermal Heat Pumps

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# GHP/GSHP

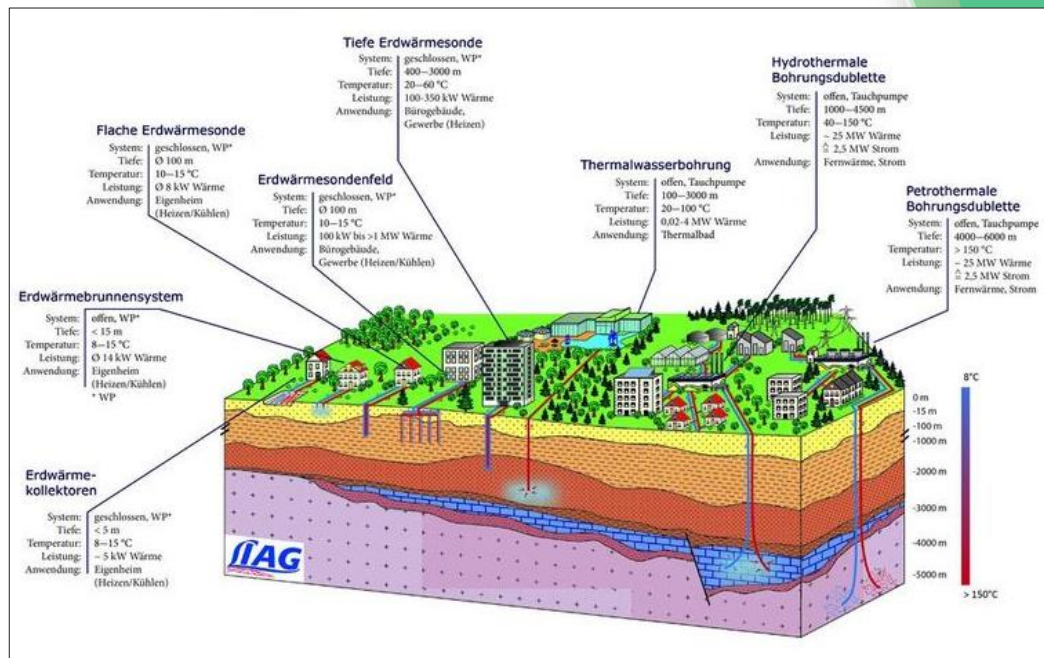
- 2,19 Mio GSHP in Europe (EGEC, 2022)
- 141.300 in 2022 (+17%) (EGEC, 2022)
- Ideal solution for :
  - New buildings (housing, public, commercial -> scalable)
  - Non-urban areas
- Part of the future „heat puzzle“



GeoPLASMA-CE

# Geothermal Technology Puzzle

- All geothermal technologies in different scales and on different temperature levels are needed for a renewable heat supply!



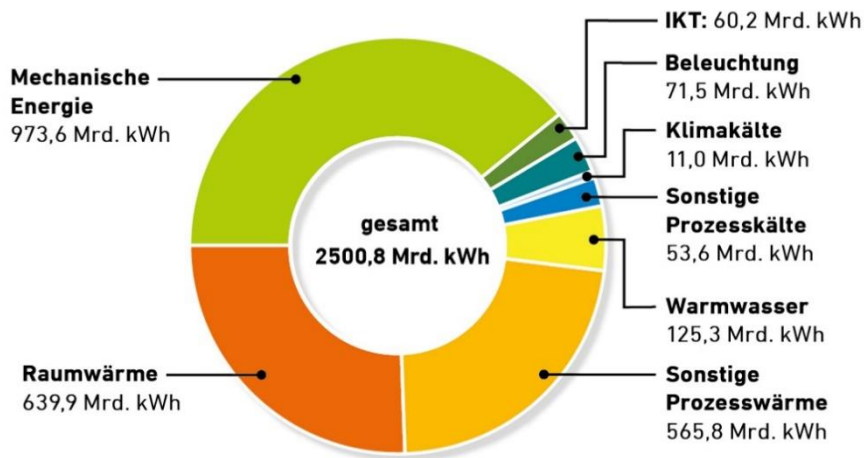
LIAG, Prof. I. Moeck

# Industrial applications

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# Industrial Heat demand

Endenergieverbrauch nach Anwendungsbereichen 2018



Quelle: BMWi  
Stand: 4/2020

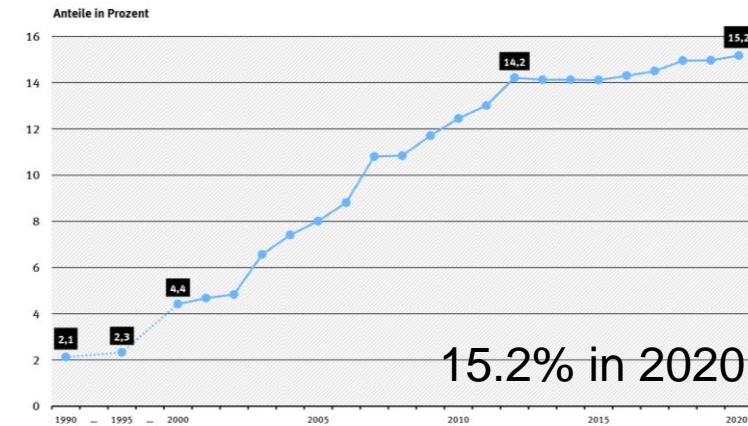
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~53% H&C in general

-> ~26% Process H&C

Anteil erneuerbarer Energien am Endenergieverbrauch für Wärme und Kälte

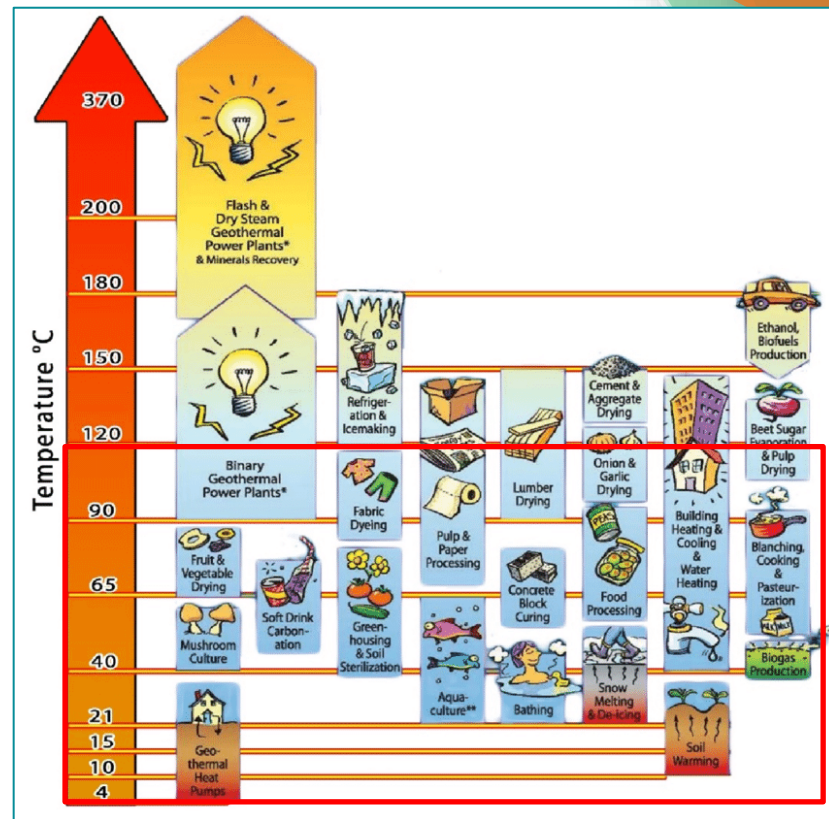
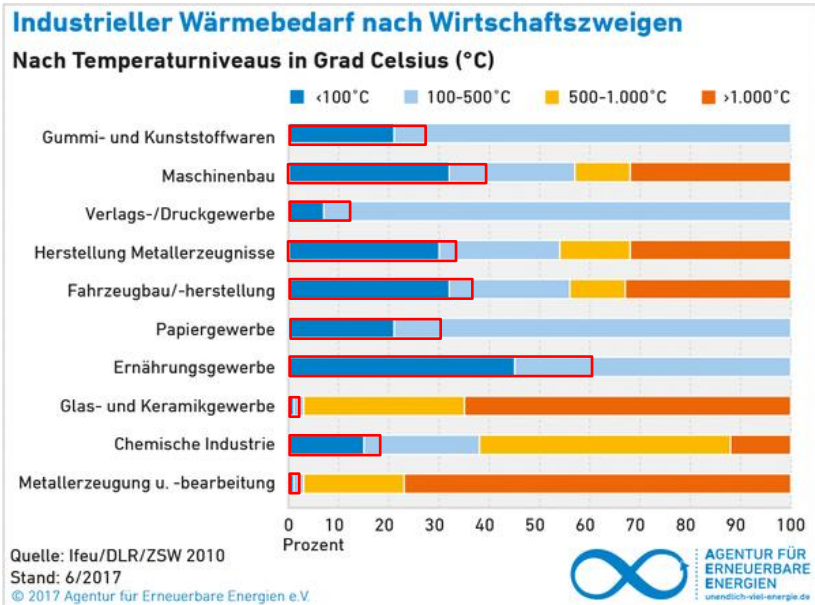


15.2% in 2020

\* vorläufige Angaben

Quelle: Umweltbundesamt (UBA) auf Basis AGEE-Stat, Stand 02/2021

# Industrial Heat demand



Miklovic (2014): The Lindal Diagram (after Lindal, 1973, Geothermal Education Office 2005)

# Examples

Agriport A7/ECW Middenmeer, The Netherlands [www.geothermie.nl](http://www.geothermie.nl)





# Viabile perspectives

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# The EU road to climate neutrality

- REPowerEU
- Revision of the Renewable Energy Directive
- Net-Zero Industry Act
- Critical Raw Materials Act

*LT and MT geothermal can contribute  
What next steps do we need?*

## Many are supporting this...

- 2023: GEOHERMICA initiative established, to guarantee lasting exchange among governments – *as we witness today*
- At European level, EGEC has always considered all uses of geothermal energy
- 2023: SET Plan Geothermal IWG and the ETIP Geothermal consider the whole depth range
- The CETPartnership TRI4 Heating and Cooling supports R&I projects
  - Special topic Geothermal energy in the 2023 Call
- Local for local – let's inspire each other how it can be done!

Have a fruitful day!