

Can energy storage serve as a new perspective for unused building complexes?

A study on the example of former military and industrial buildings

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Organisers:



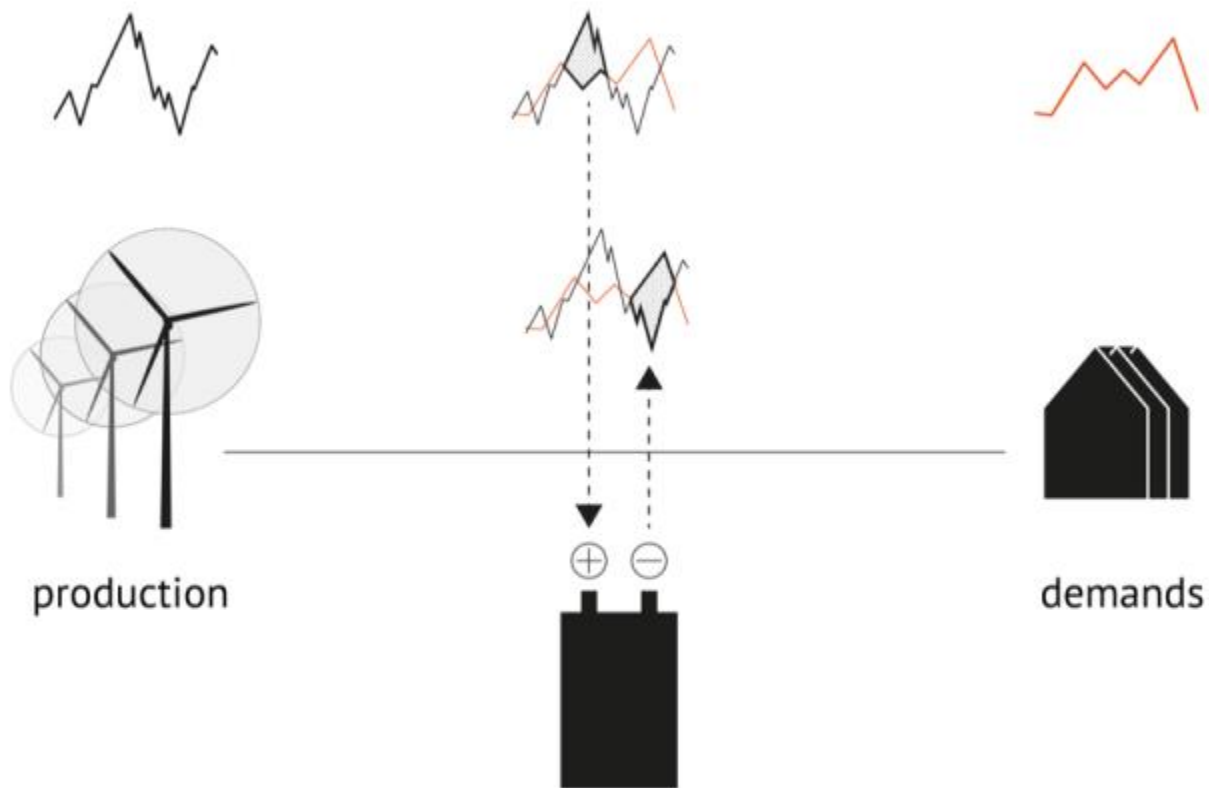
International Co-owners:

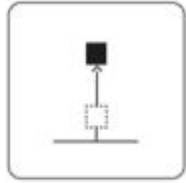


Sustainable Buildings
and Climate Initiative



Global Alliance
for Buildings and
Construction





storage systems



demands

preconditions



building types



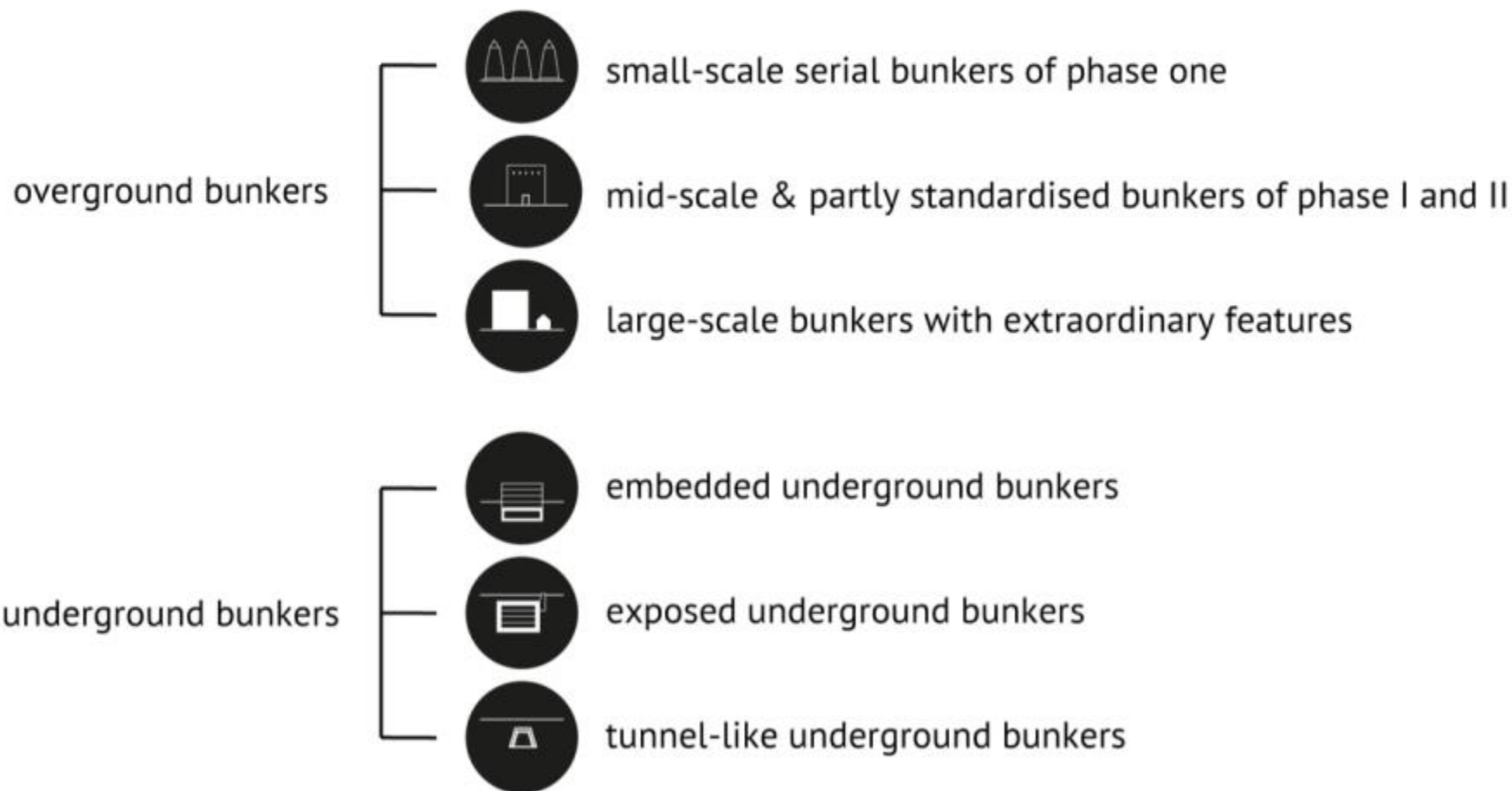
Organisers:

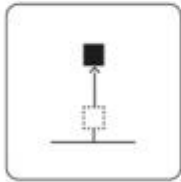


International Co-owners:



App. 3000 former bunkers dating back to WWII in Germany





- ample volume capacity
> 0,13 und 0,75 kWh/m³

- form activity

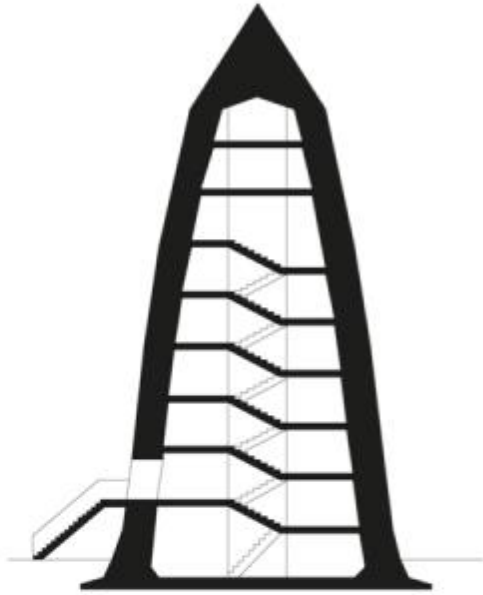
- heat source availability

- load bearing capacity
> 800 – 3200 kN/m²

- closed shell

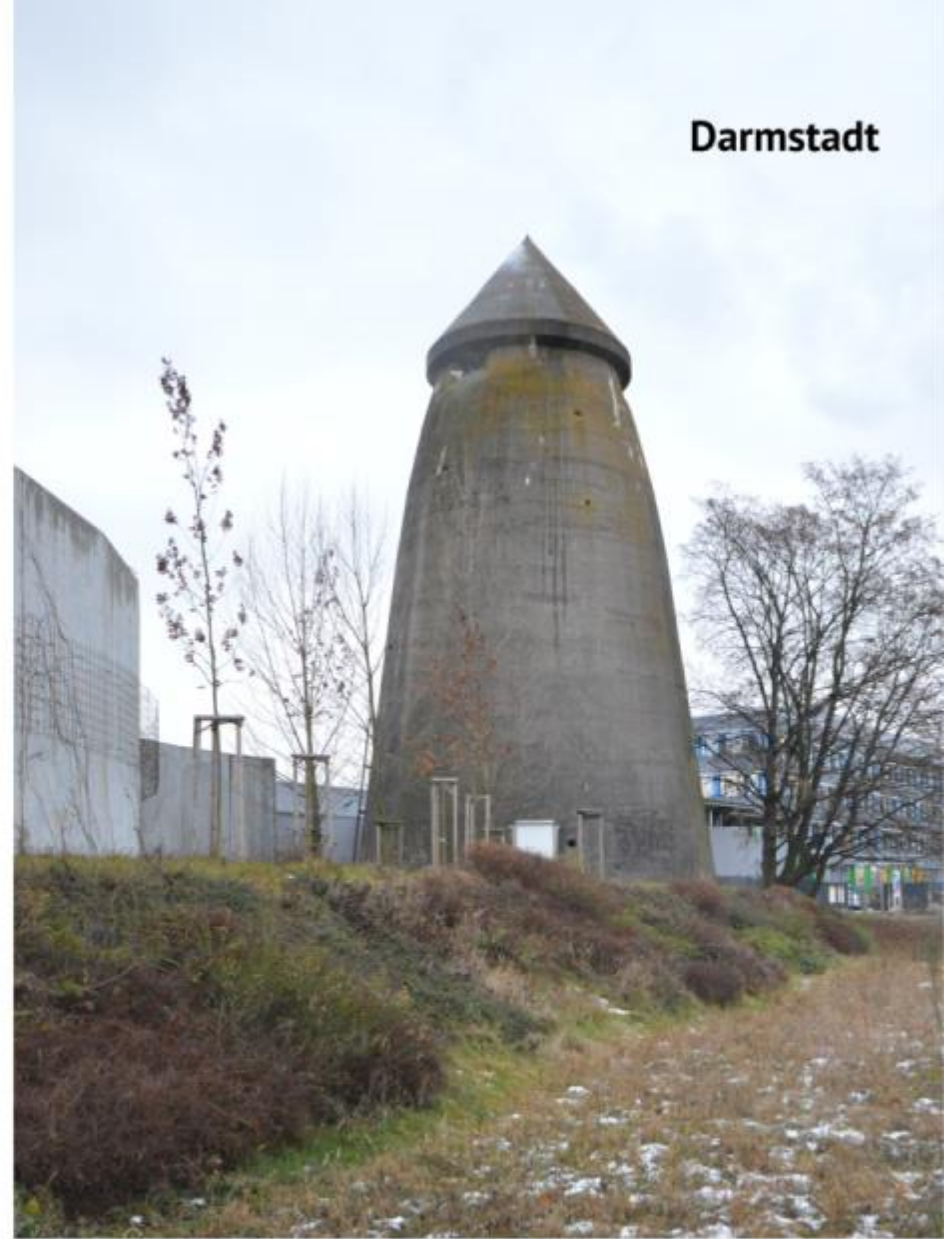
- sub-terrain volumes

small-scale serial bunkers of phase one



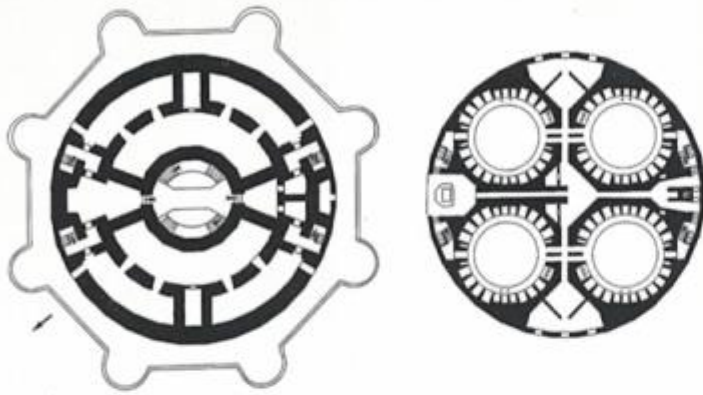
size	Ø 10, h 22	[m]
capacity	1000	[m ³]
shell	2	[m]

Darmstadt



large-scale bunkers with extraordinary features

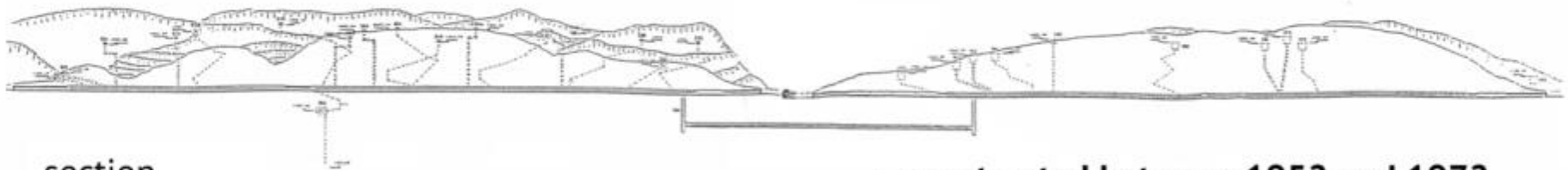
Vienna



size	Ø 43, h 55	[m]
capacity	80 000	[m ³]
shell	up to 3,50	[m]

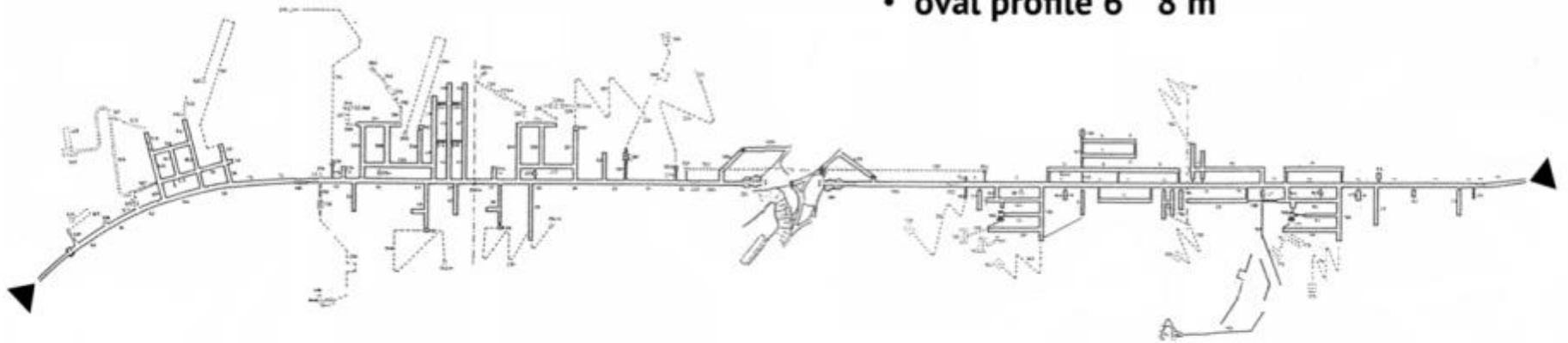


tunnel-like underground bunkers | former government bunker in the Ahrtal



section

- constructed between 1952 and 1972
- dismantling completed 2006
- overall tunnel length 19km
- oval profile 6 * 8 m

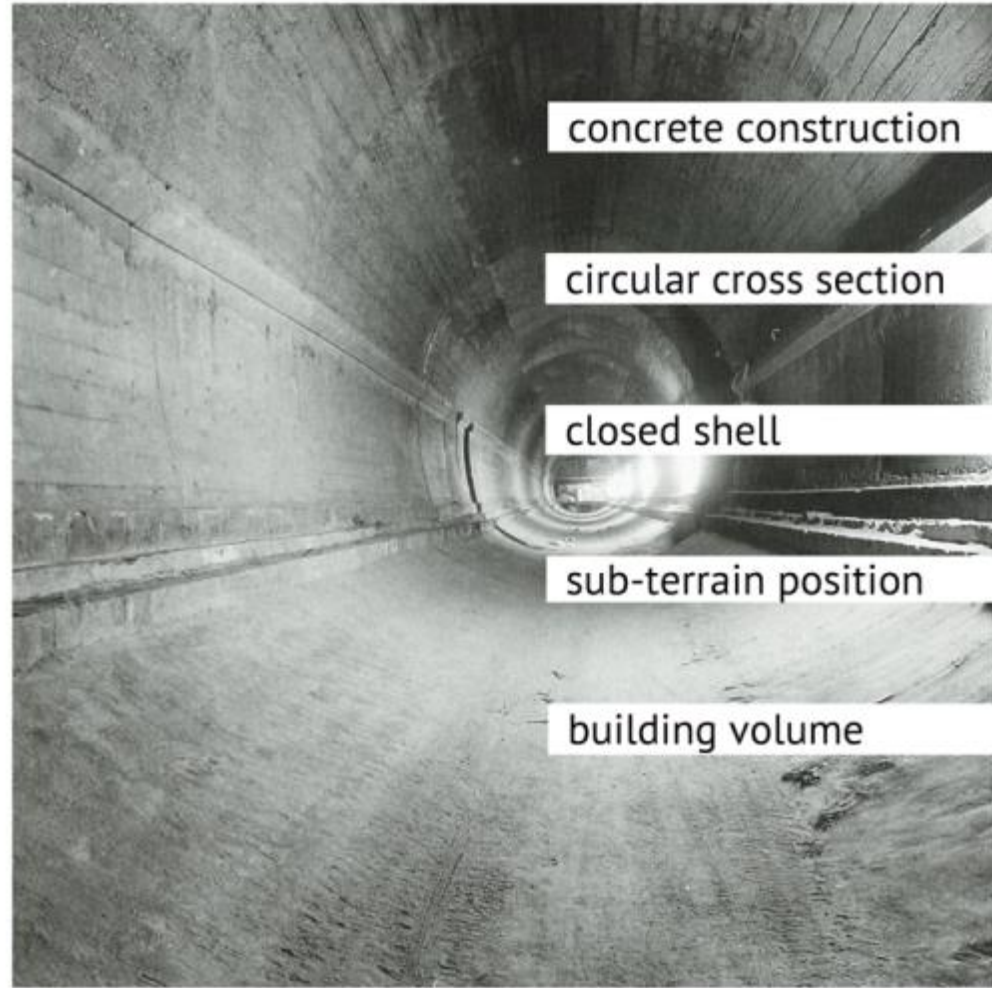


floor plan

tunnel-like underground bunkers | **former government bunker in the Ahrtal**



compressed air storage



volume	250 000	[m ³]
pressure	8 - 32	[bar]
density	0,35 – 0,75	[kWh/m ³]
capacity	88 – 188	[MWh]

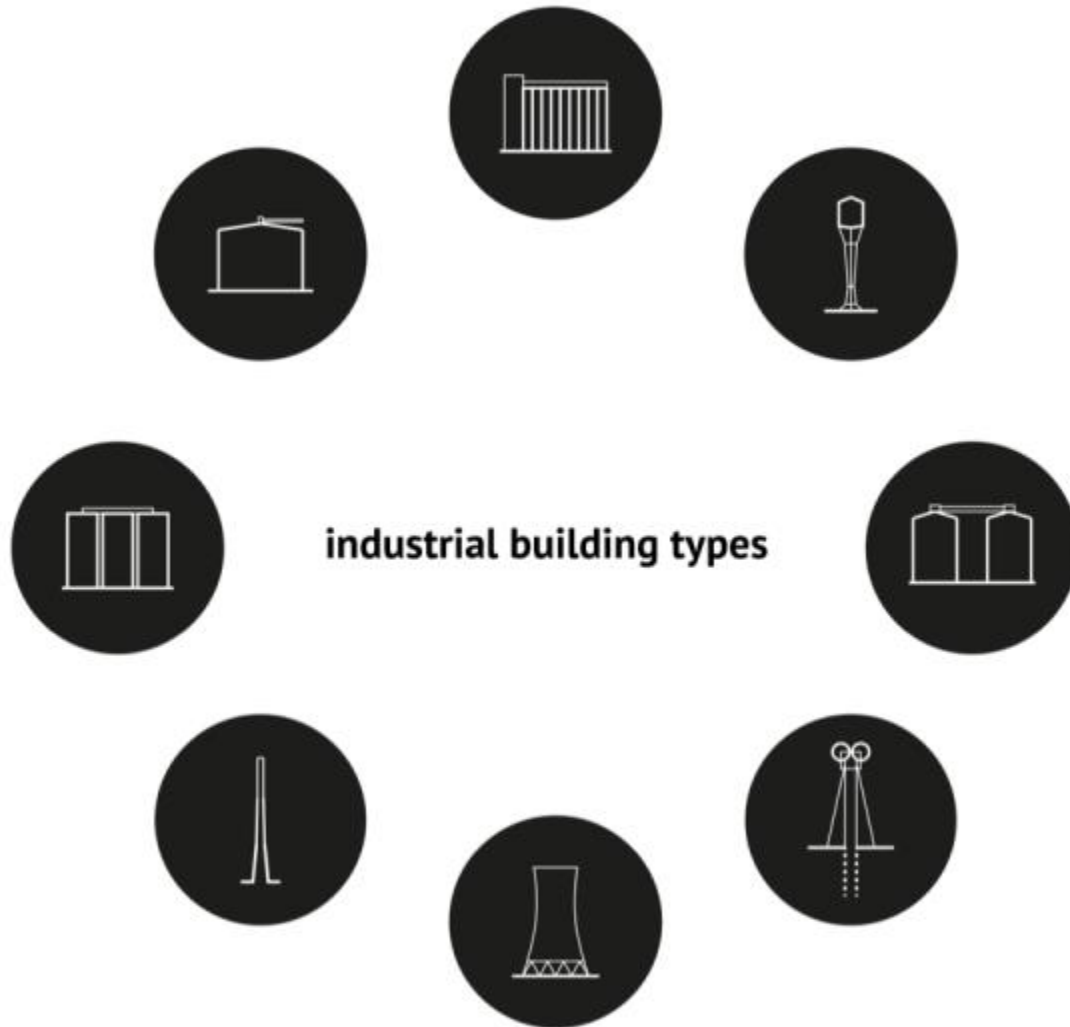


Organisers:

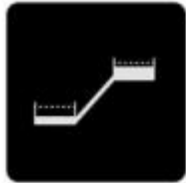


International Co-owners:

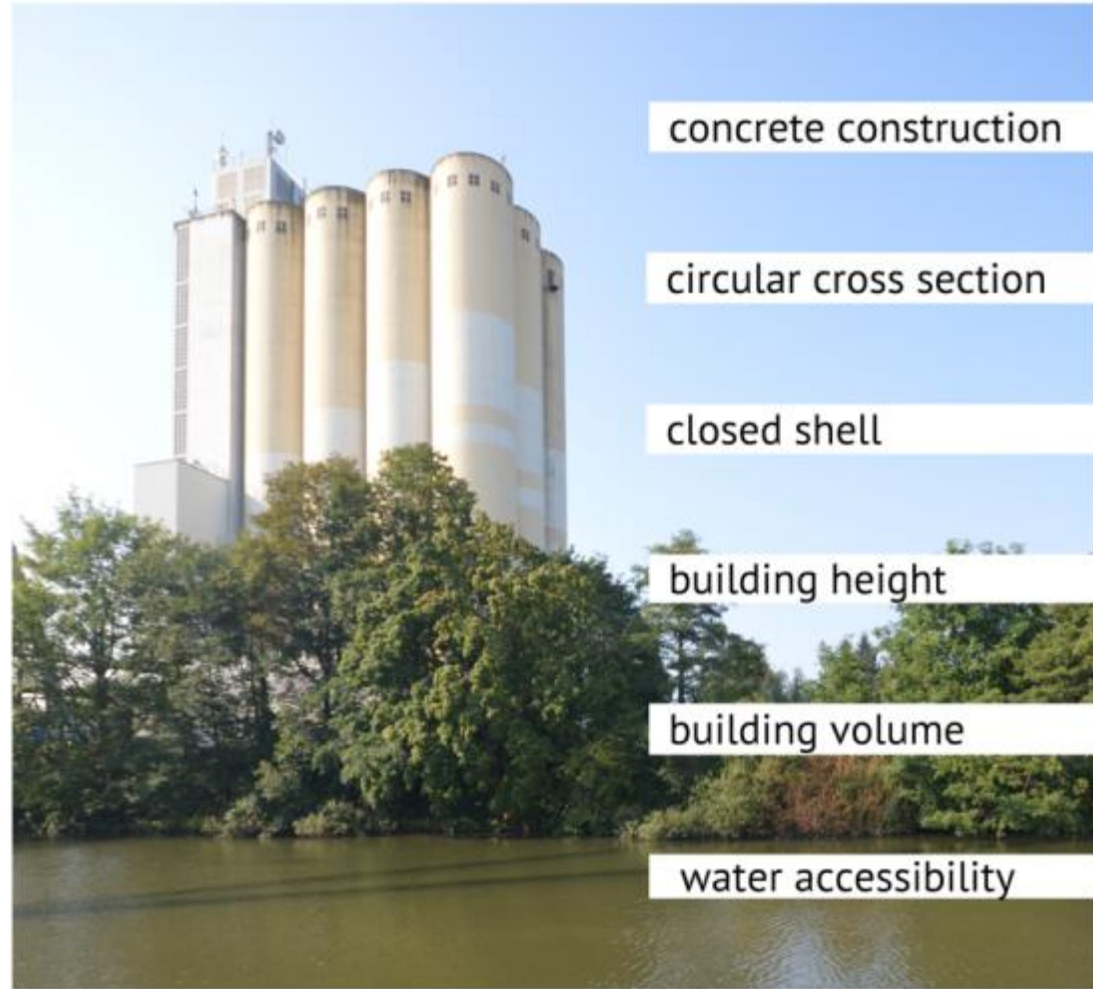




case study | vacant grain silo



pump water storage



concrete construction

circular cross section

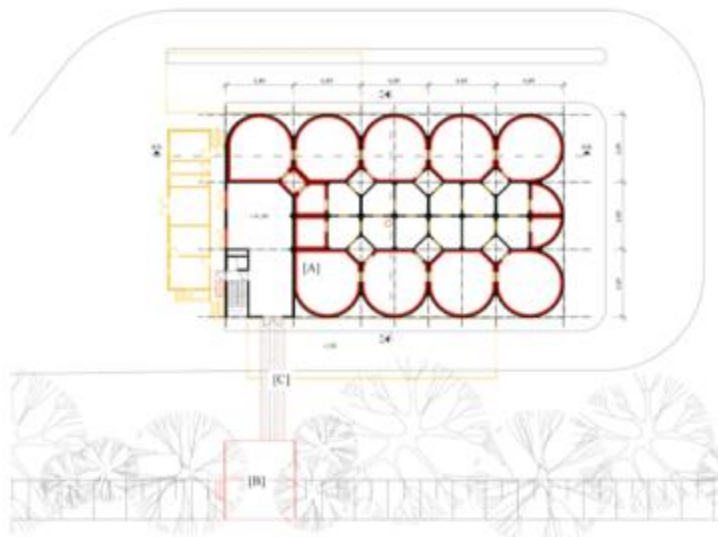
closed shell

building height

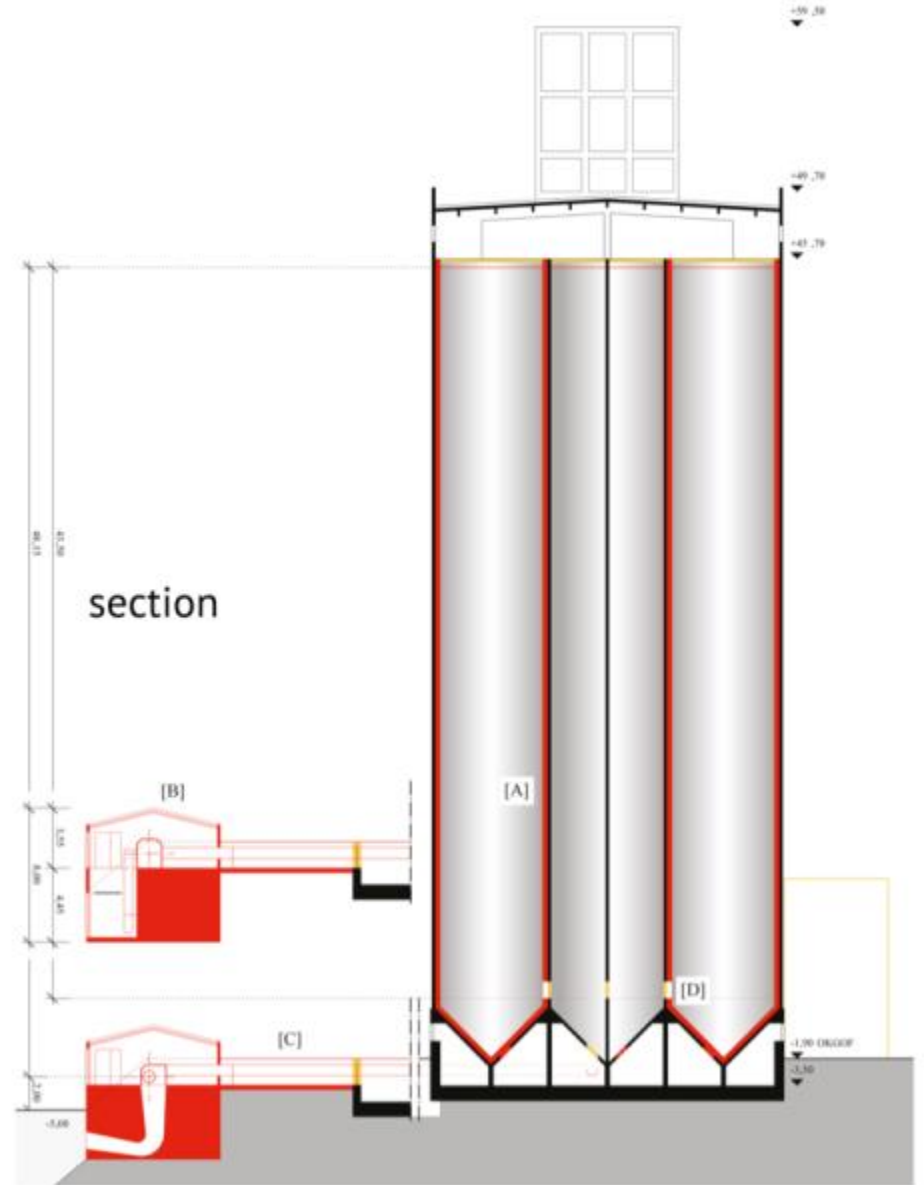
building volume

water accessibility

erected	1959	[-]
height	52	[m]
volume	20 000	[m ³]
capacity	1027	[kWh]



floor plan



section

building costs estimation

overall costs	3.300.000	[€]
costs/capacity	3200	[€/kWh]

Final conclusions

- > significant potential in the typology of tunnel-like underground bunkers
- > in depth analysis and case study necessary
- > other large-scale facilities from the Cold War period exist
- > suited building types are also found in the industrial building sector
- > e.g. cooling towers or silos have a high potential
- > case study of the grain silo demonstrates feasibility and efficiency
- > conversion can help maintain building culture
- > conversion saves material, energy and space

+ SUSTAINABILITY

Thank you



Organisers:



International Co-owners:

