

Development of an appropriate water treatment for the karst region Gunung Kidul, Southern Java

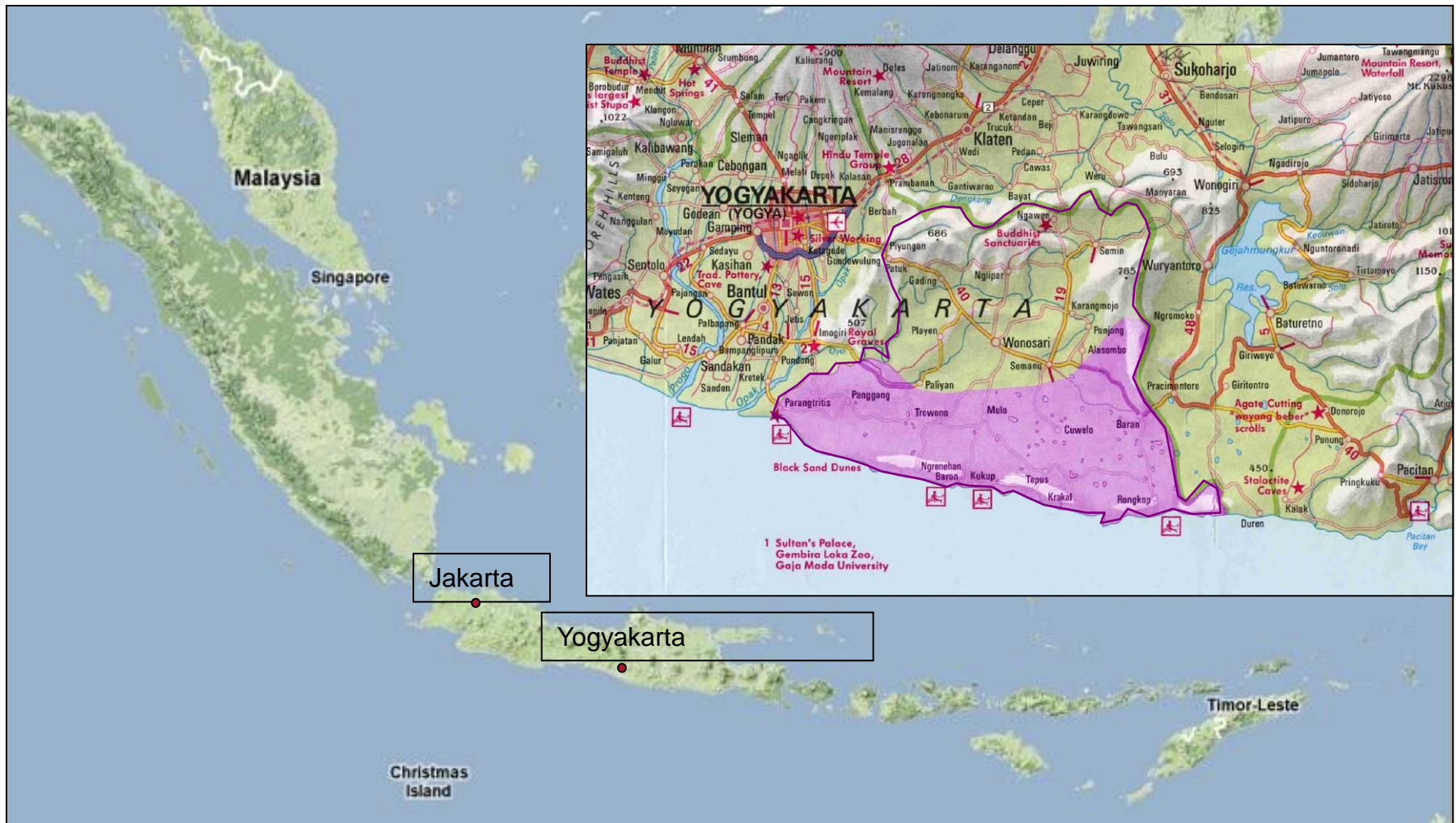
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DEPARTMENT OF INTERFACE MICROBIOLOGY

This project is funded by



Investigation Area: Gunung Kidul

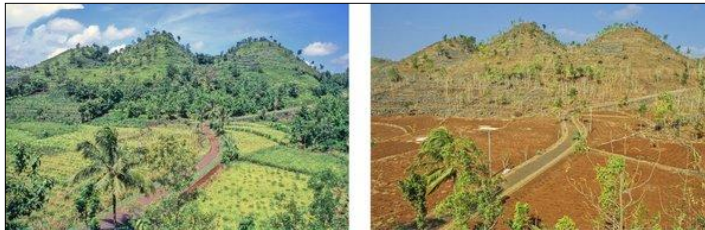


Motivation	Monitoring	Treatment	Conclusion	Outlook
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Current Situation in Gunung Kidul

Natural conditions

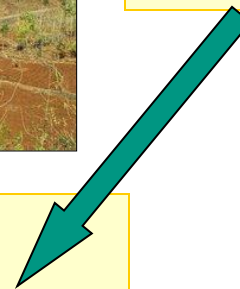
- Tropical climate
- Karst formation
- Poor retention and filtration capacity
- Water shortages in dry season



pictures: IfG, Gießen

Man-made circumstances

- Deficient waste water treatment
- Dilapidated pipelines and reservoirs
- Deficient water treatment
- Lack of monitoring



Results

- Small water amount
- Bad water quality



Population is forced to boil water

- Barely sustainable
- Problematic with high amounts of water

Motivation

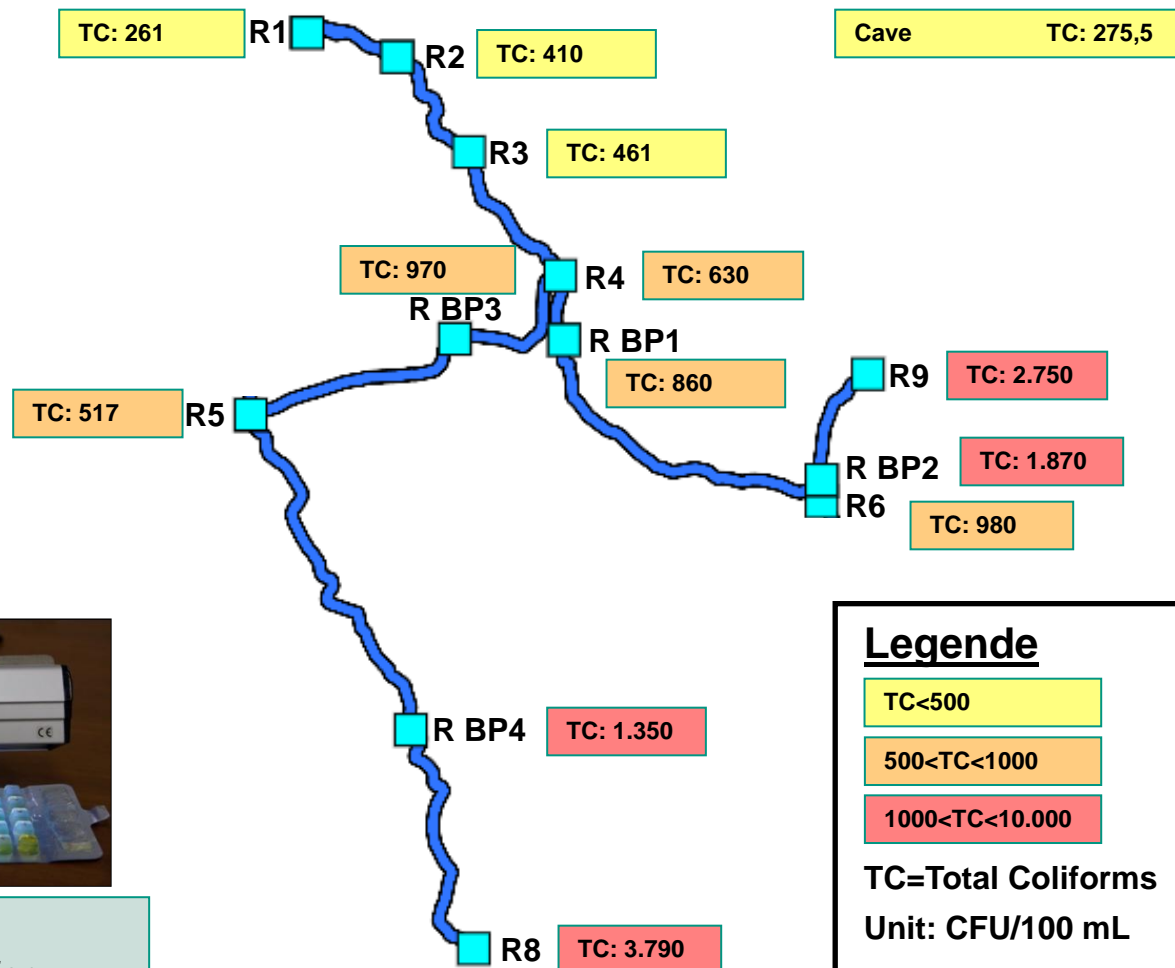
Monitoring

Treatment

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Distribution of Coliforms in July 2010



WHO guideline:
0 CFU/ 100 mL for
Coliforms and *E.coli*

CFU= Colony Forming Units

Legende

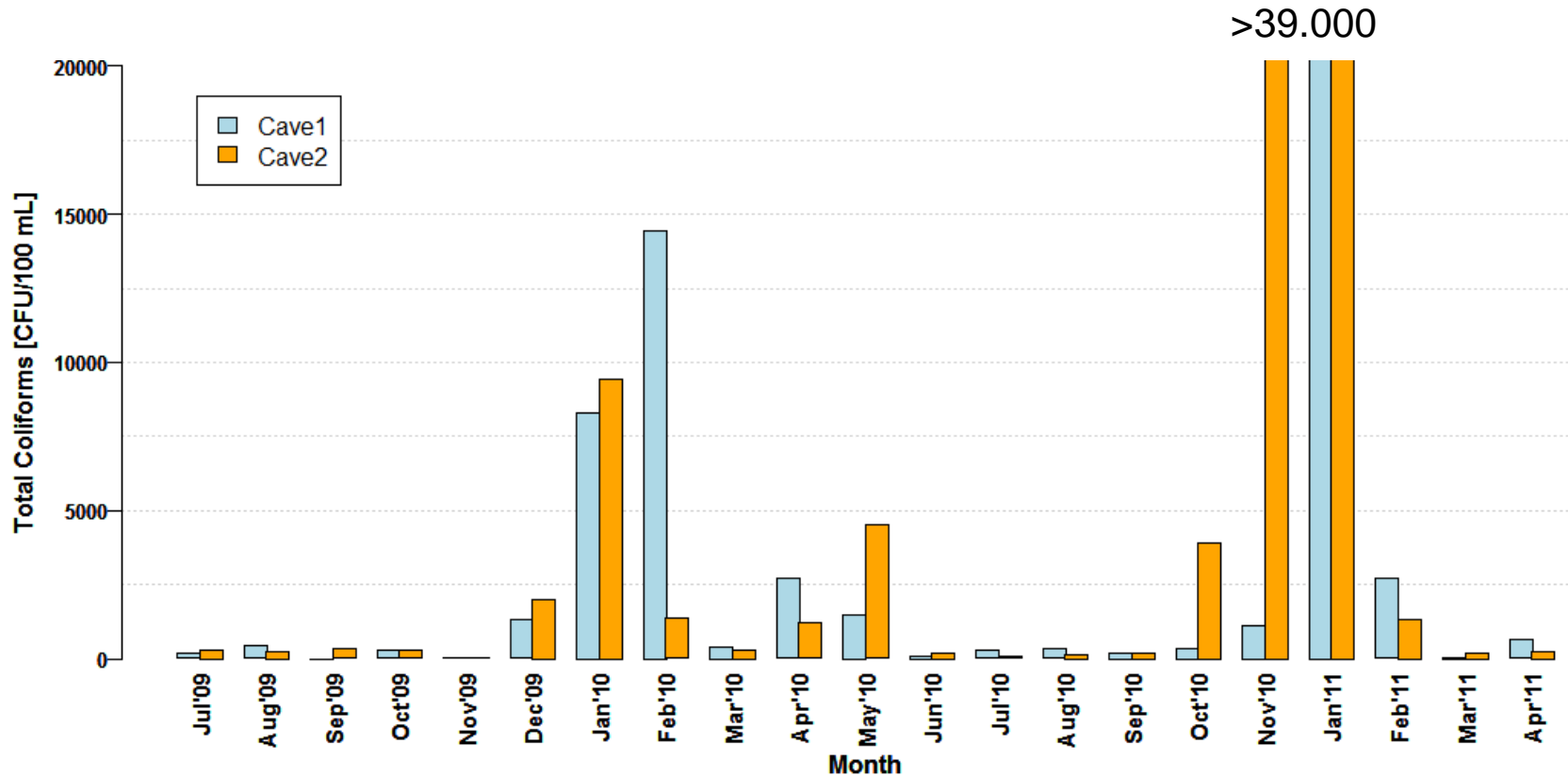
- TC < 500
- 500 < TC < 1000
- 1000 < TC < 10.000

TC=Total Coliforms
Unit: CFU/100 mL

map: <http://iwrw.gik.uni-karlsruhe.de/mapguide/iwrw>

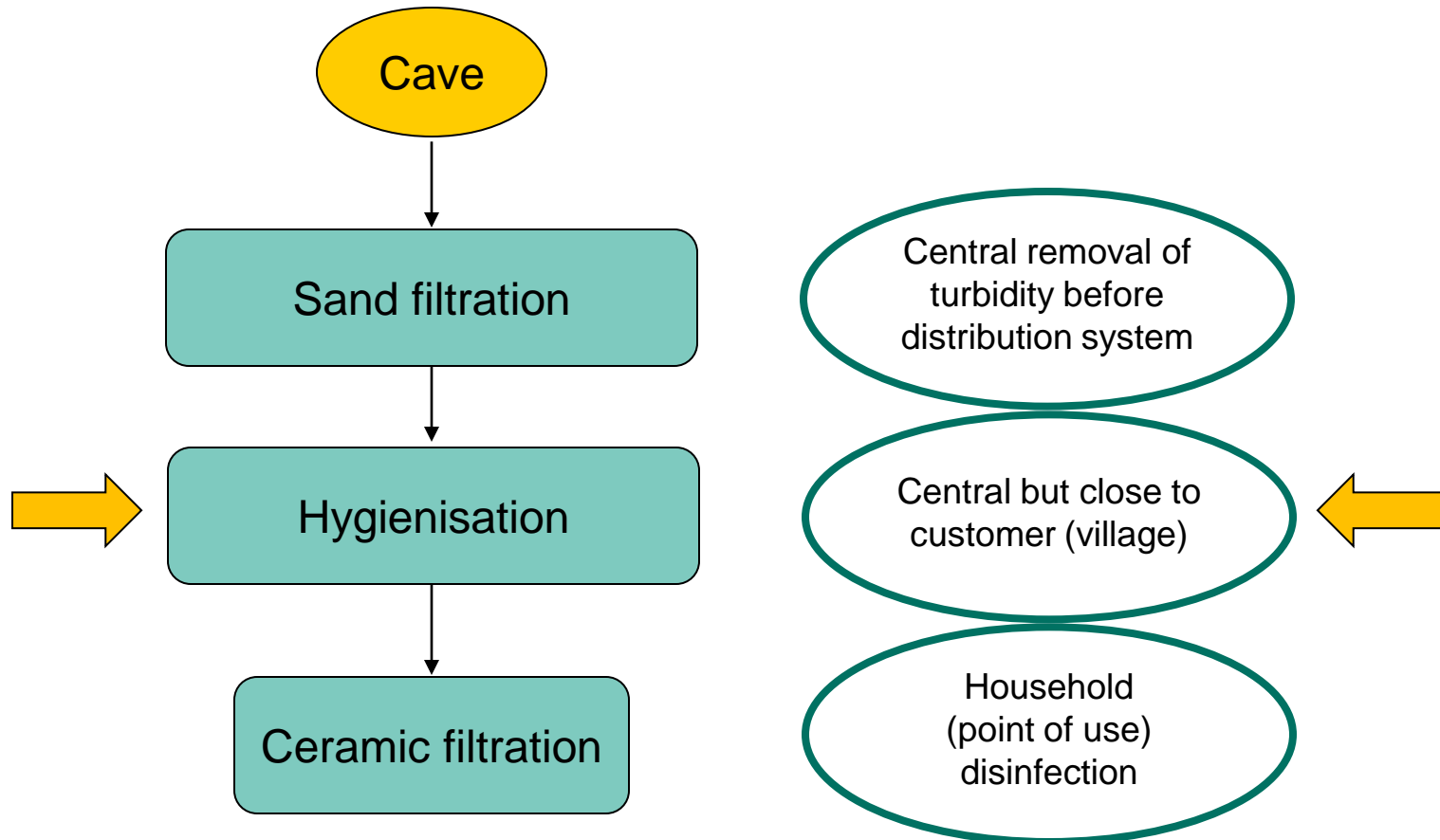
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Coliform Contamination in both Caves



Motivation	Monitoring	Treatment	Conclusion	Outlook
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Water Treatment Concept



Motivation	Monitoring	Treatment	Conclusion	Outlook
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Field Laboratory

- Sand filtration
- UV disinfection
- Chlorination
- Ceramic filtration



Motivation

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Sand Filtration and UV Disinfection

- Sand filtration samples taken after running period of five weeks
- UV disinfection samples taken after running period of 25 h
- UV-C dose at 254 nm: 423,2 J/m²

	Raw water	After sand filtration	After UV disinfection		Max allowed
Bact. count at 22 °C [CFU/mL]	>100	>100	0	Bact. count at 22 °C [CFU/mL]	20
Bact. count at 36 °C [CFU/mL]	>100	>100	52	Bact. count at 36 °C [CFU/mL]	100
Total coliforms [CFU/100 mL]	4	3	0	Total coliforms [CFU/100 mL]	0
<i>E.coli</i> [CFU/100 mL]	15	40	0	<i>E.coli</i> [CFU/100 mL]	0

Chlorination

- Chlorination with Calciumhypochlorite (Indonesian Kaporit)
- Residual Chloride: 0.65 mg/L; 1.02 mg/L; 1.25 mg/L; 3.3 mg/L

	Raw water	First set		Raw water	Second set	
		0.65 mg/L	1 mg/L		1.25 mg/L	3.3 mg/L
Bact. count at 22 °C [CFU/mL]	>100	23	0	>100	0	0
Bact. count at 36 °C [CFU/mL]	>100	fungi	fungi	>100	0	0
Total coliforms [CFU/100 mL]	>200	0	0	>200	0	0
<i>E.coli</i> [CFU/100 mL]	110	0	0	24	0	0

Motivation

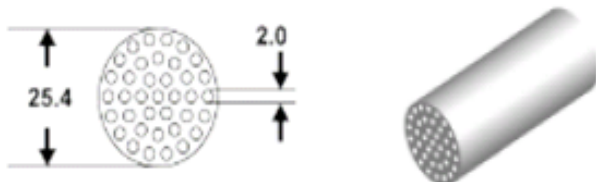
Monitoring

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Ceramic Filtration



Reference: atech innovations gmbh

Cross-Flow-Method

- Pore size 200 nm
- Pore size 50 nm

	Raw water	50 nm membrane		Raw water	200 nm membrane	
		0 NTU	20 NTU		0 NTU	20 NTU
Bact. count at 22 °C [CFU/mL]	>100	0	21	>100	4	25
Bact. count at 36 °C [CFU/mL]	45	24	10	fungi	0	45
Total coliforms [CFU/100 mL]	165	0	0	>200	0	2
<i>E.coli</i> [CFU/100 mL]	41	0	0	>200	0	1

Motivation

Monitoring

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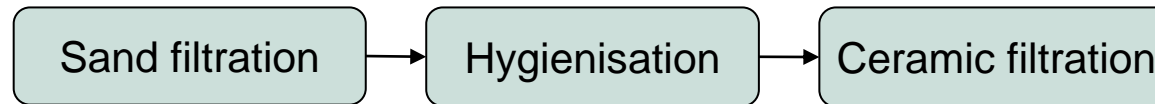
Outlook

Conclusion

High contamination with hygienically relevant bacteria

Thorough water treatment is essential

Water treatment concept:



Hygienisation

- Chlorination, UV disinfection & ceramic filtration show good disinfection capacity
- Sand filtration known to have good retention capacity under appropriate conditions (low flow rate etc.)

Techniques seem appropriate, but have to be repeated under Indonesian conditions

Motivation

Monitoring

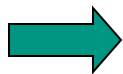
Treatment

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Future Plans

- Project runs until 2013
- Ongoing monitoring
- Shipping of field laboratory to Indonesia (this year)
- Repetition of experiments under Indonesian conditions
- Capacity Development



Development and introduction of appropriate water treatment technology in project region

Motivation

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Acknowledgements

This project is funded by



Thank you for your attention!

? Questions ?



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PFORZHEIM GMBH

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