SMART-Control:

Smart Framework for real-time monitoring and control of subsurface processes in managed aquifer recharge applications

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2017 JOINT CALL

JPI Water Kick-Off Event

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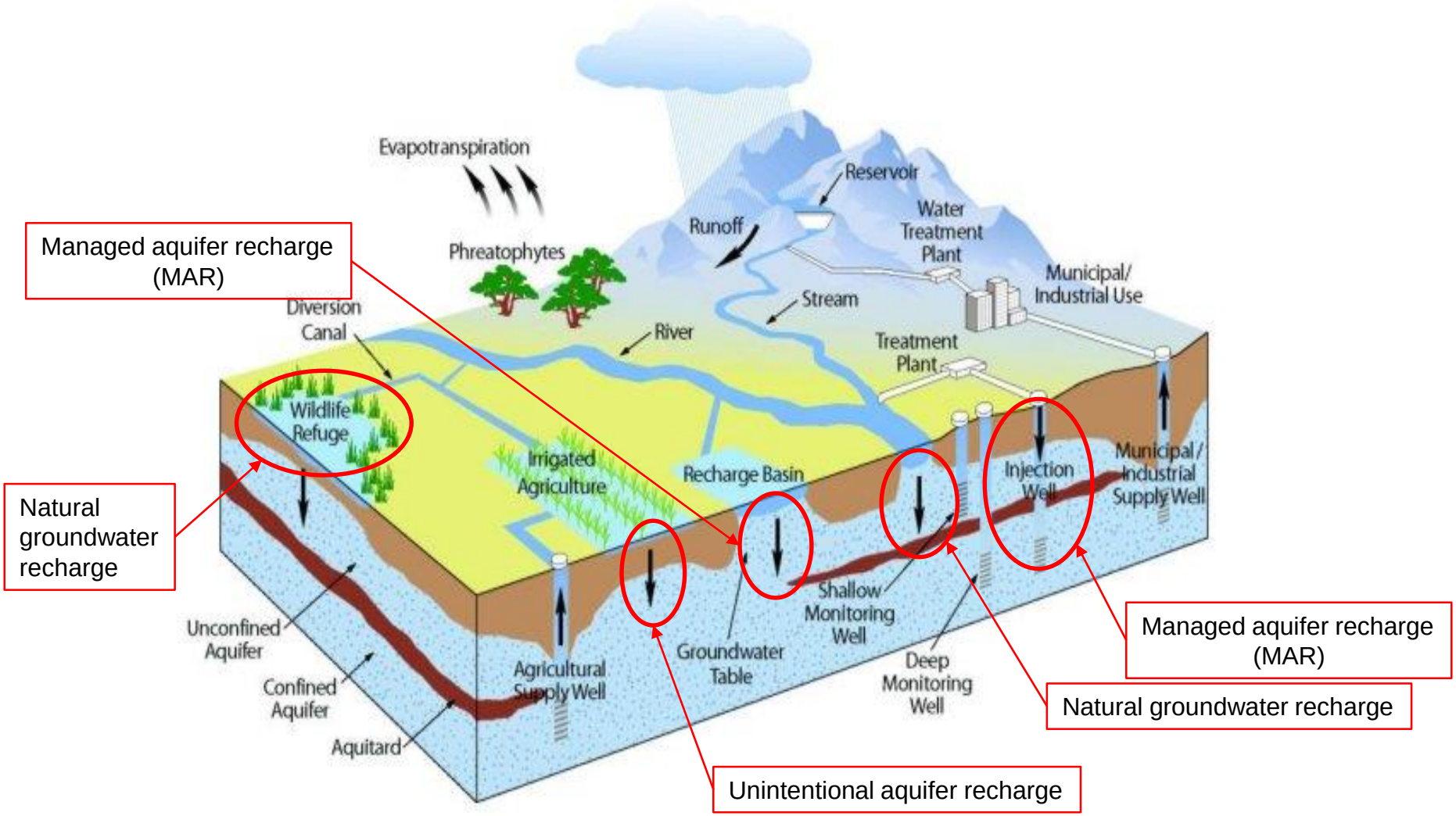
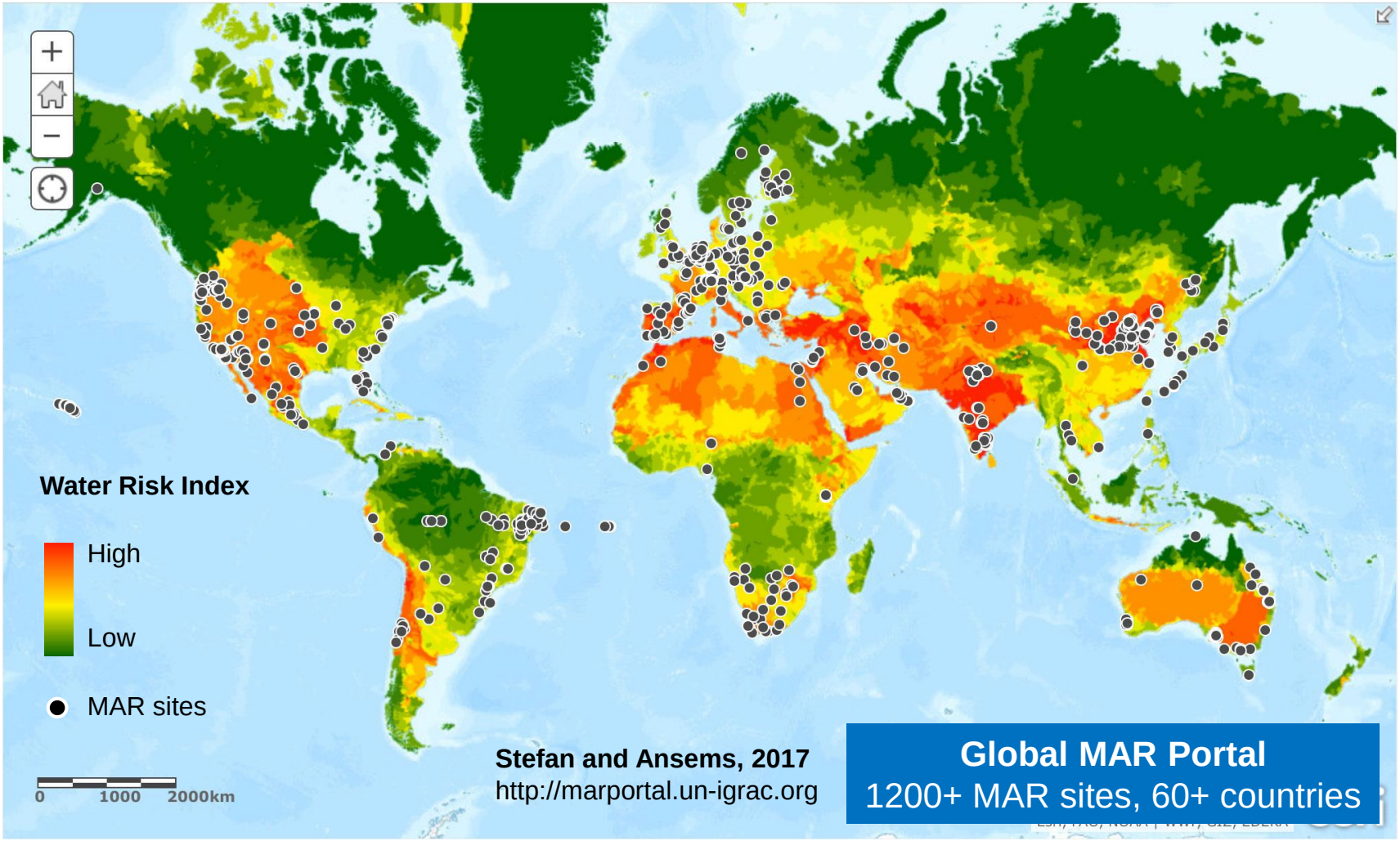
Funded by:

06.02.2019, Paris

Introduction | Managed Aquifer Recharge



Introduction | MAR Worldwide



Objectives

- → to reduce the risks in the application of sustainable groundwater management techniques (e.g. managed aquifer recharge) by the development of an innovative **web-based, real-time monitoring and control system (RMCS)** in combination with **risk assessment and management tools**.
- → **increase the capacity and social acceptance** of water reuse technologies and **demonstrate their viability** as climate change adaptation measures.

Specific objectives:

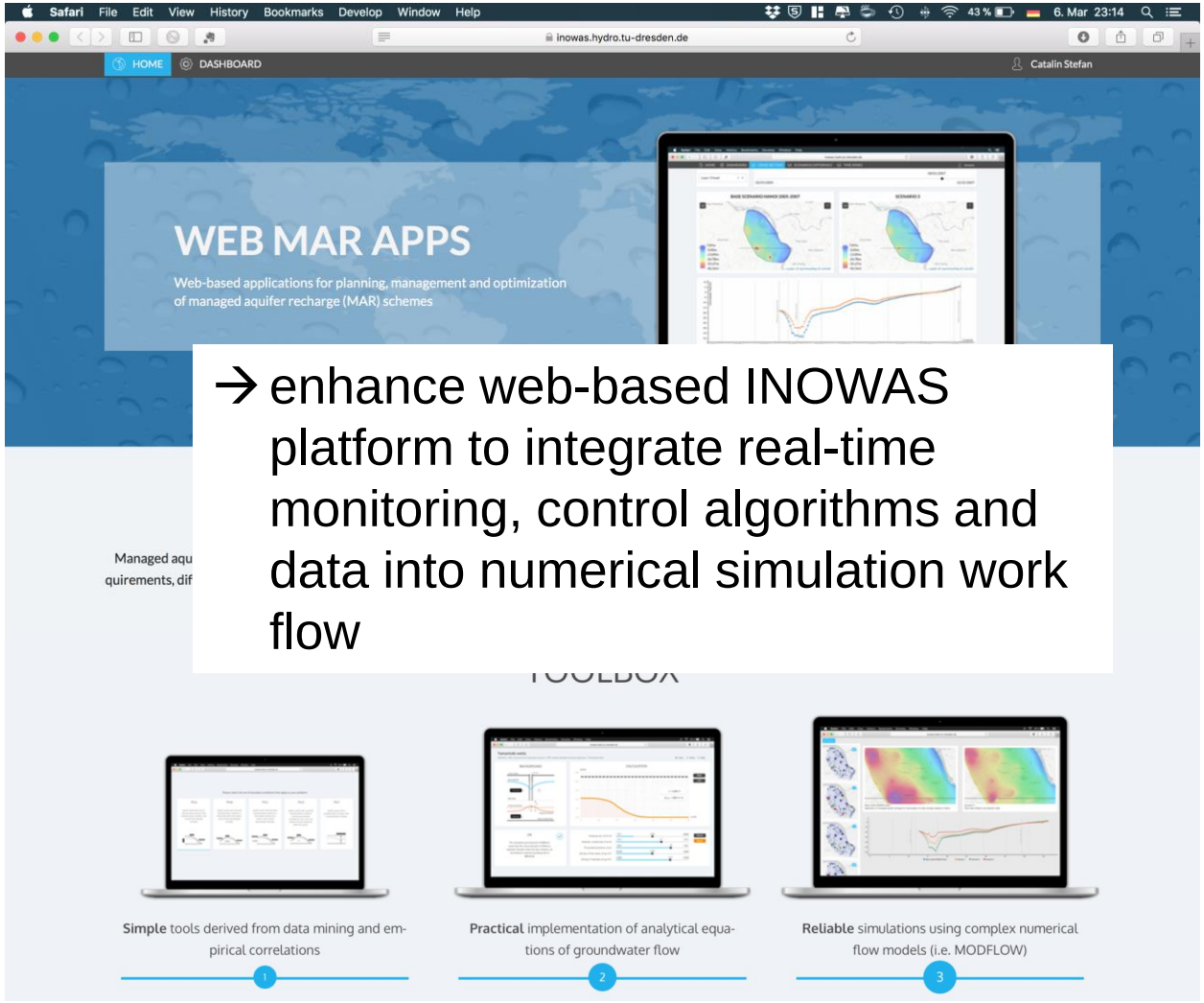
- → compile integrated framework for assessing and managing MAR-associated risks and benefits
- → development of risk assessment and management tools
- → demonstration of approach to case studies applying different MAR technologies in various hydrogeological, climatic and socio-economic environments
- → training in the use of SMART-Control software
- → technological transfer concept and cost-benefit analysis to enhance the replication of the approach

Web-based INOWAS platform

www.inowas.com

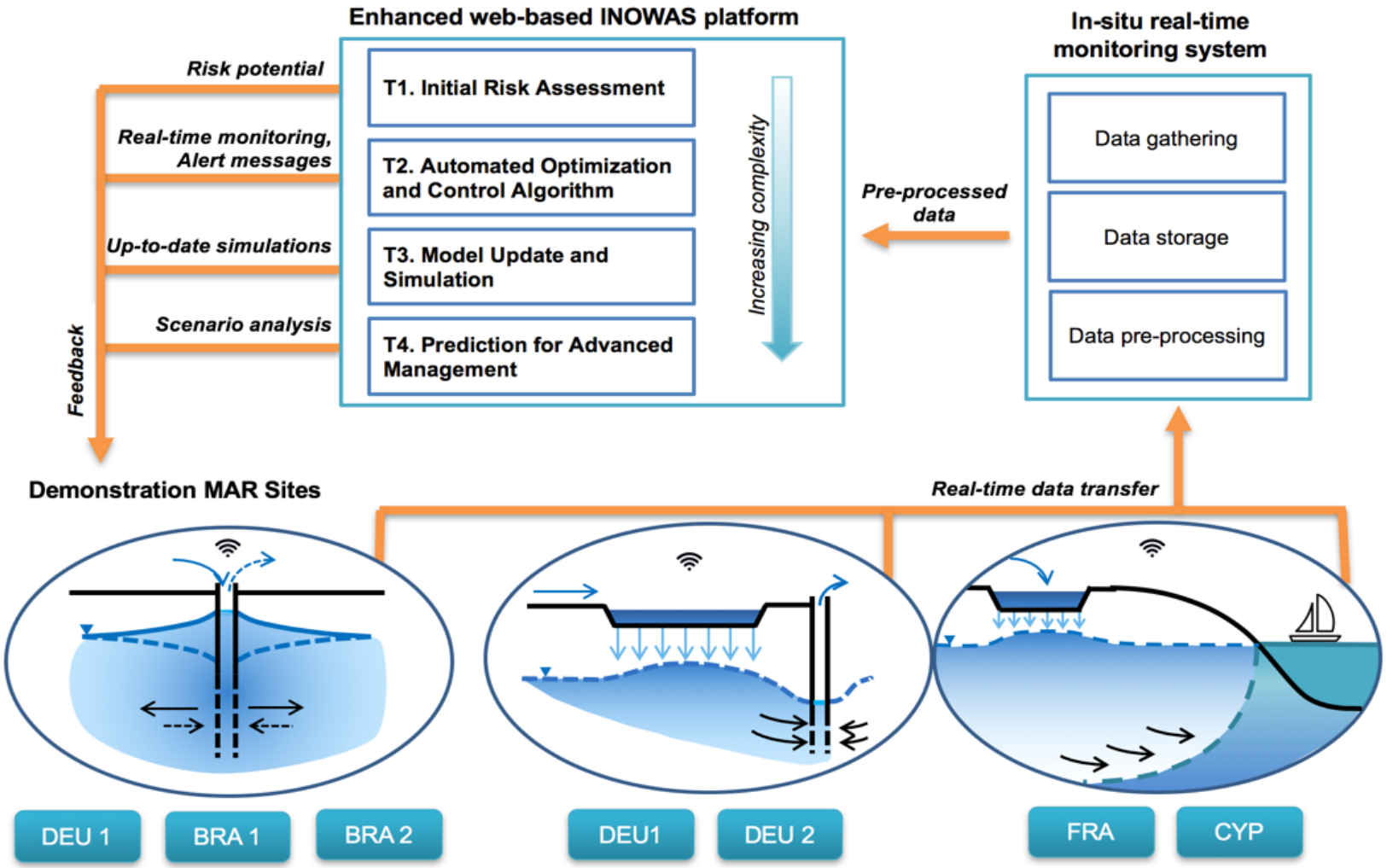
Advantages:

- Web-based (web browser)
- Open source
- Tools of varying complexity (empirical, analytical, numerical)
- Cloud modeling (parallel / scalable)
- Online documentation
- Accessibility of data and projects worldwide
- Easy collaboration between various modelers/decision makers



→ enhance web-based INOWAS platform to integrate real-time monitoring, control algorithms and data into numerical simulation work flow

Approach and methodology



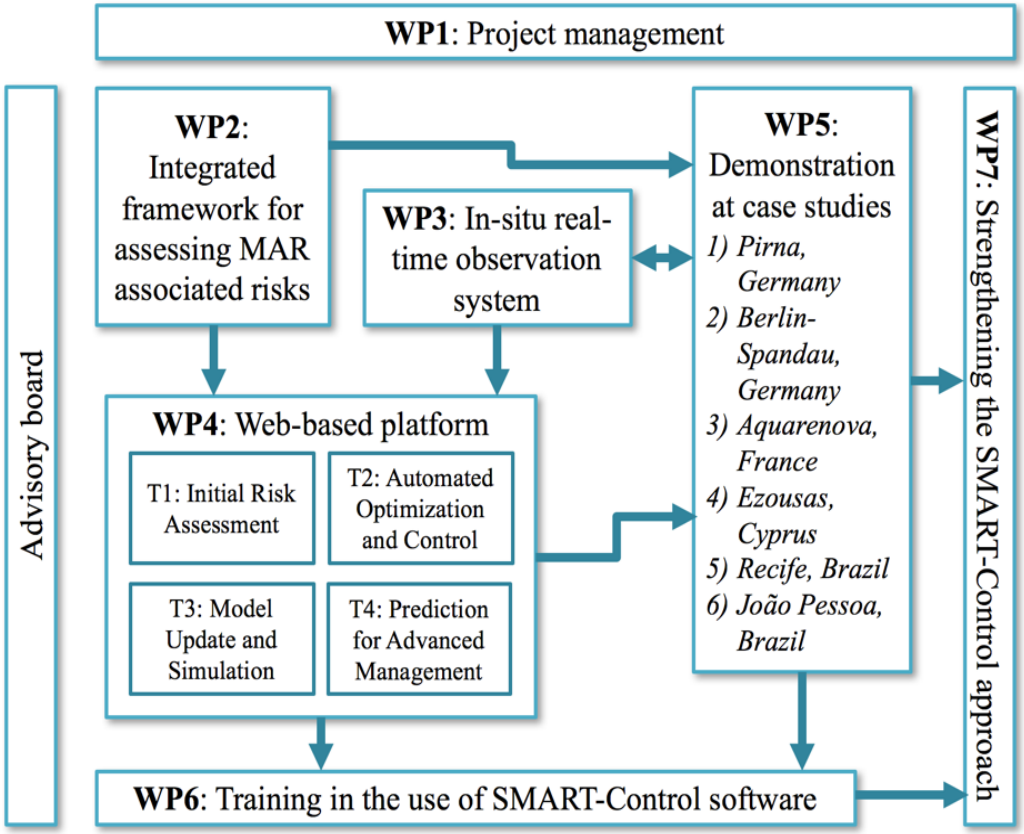
Approach and methodology | WPs

WP1: Project coordination, compilation of project reports, completion of milestones

WP2: Characterize main risks and uncertainties associated with MAR

WP3: Develop and implement the real-time observation system

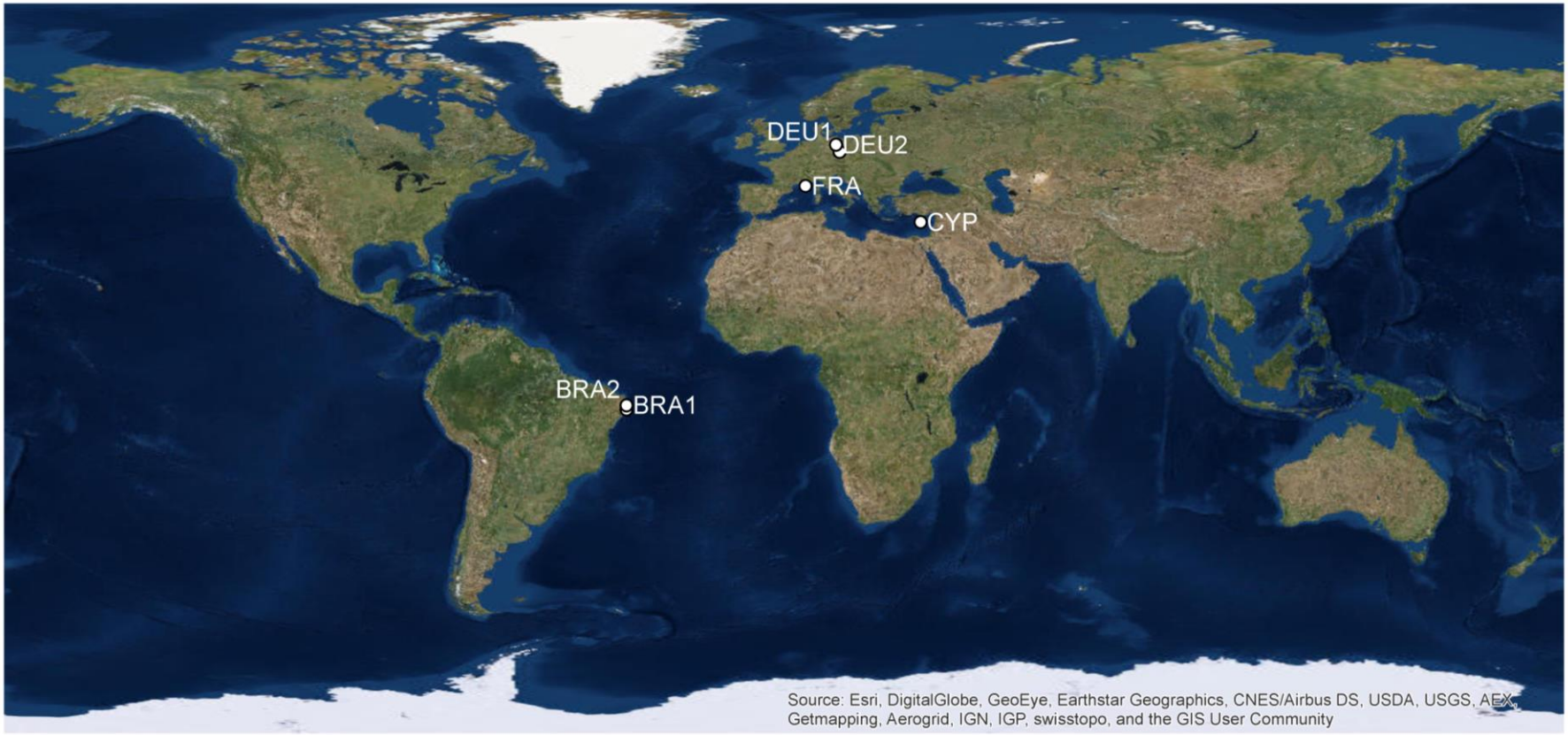
WP4: Incorporate easy-to-use tools, control algorithms, real-time numerical modelling and prediction analysis into the INOWAS platform



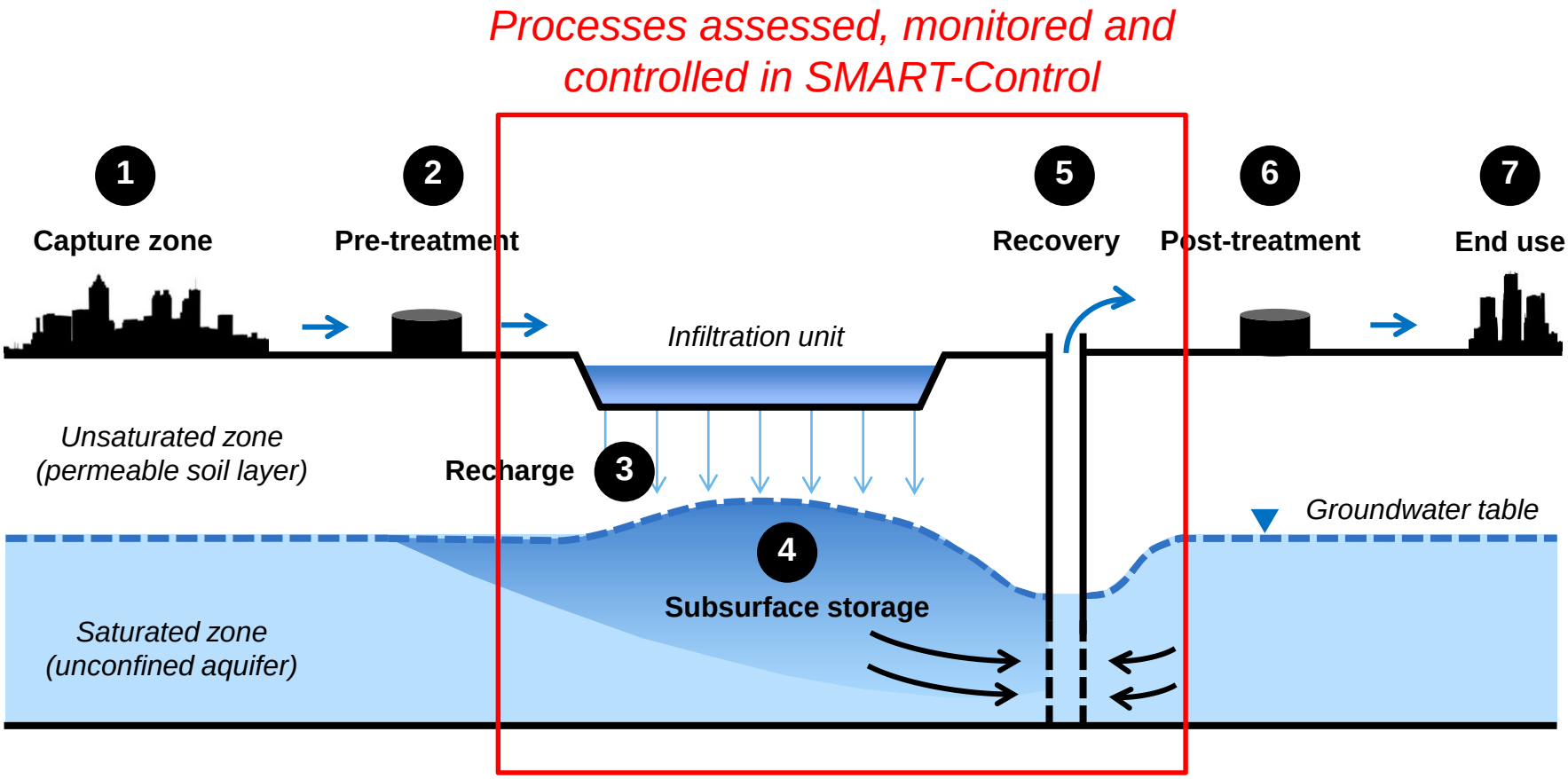
Approach and methodology | WPs

WP5: Demonstration of approach and developed tools

(transfer and adaptation of in-situ real-time observation system to six MAR schemes)



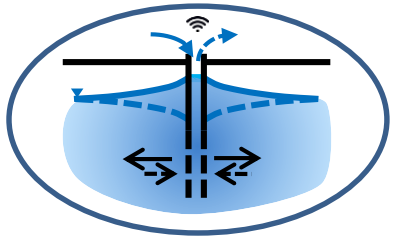
Approach and methodology | WPs



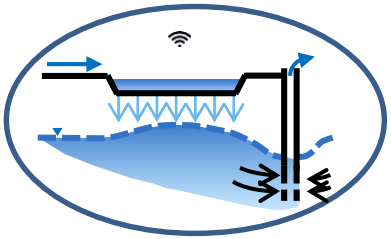
Approach and methodology | WPs

WP5: Demonstration of approach and developed tools

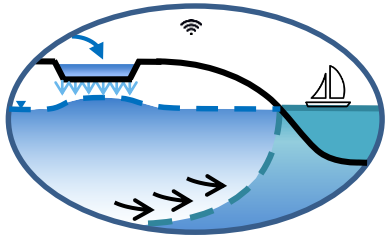
Case Study	Partner	MAR type	SMART-Control objective
Pirna DE **DEU 1**	TUD	ASR well, infiltration pond	RMCS system setup, testing and calibration; influence of recharge on water dynamics
Berlin DE **DEU 2**	KWB	Infiltration ponds	combination of real-time monitoring of subsurface residence times with high-resolution microbial dynamics
Aquarenova FR **FRA**	BRGM	Infiltration ponds	prevent saltwater intrusion and monitor saltwater wedge at the Gapeau riverbank
Ezousas CY **CYP**	UCY	Infiltration ponds	setup continuous monitoring system: locate saltwater interface, monitor water quality (nitrate)
João Pessoa BR **BRA 1**	UFPB	ASR well	setup continuous monitoring system: reduce surface runoff during flooding
Recife BR **BRA 2**	UFPE	ASR well	setup continuous monitoring system: mitigate saltwater intrusion, extreme climatic events



DE DEU 1 | BR BRA 1 | BR BRA 2



DE DEU 1 | DE DEU 2



FR FRA | CY CYP

Approach and methodology | WPs

WP6: Training in SMART-Control software

- Workshops within the project partner's countries
- Training material (tutorials, datasets) and courses
- Webinars to reduce application barriers

WP7: Strengthening SMART-Control approach

- Dissemination and promotion of project results via various media
- Development of technological transfer concept
- Cost-benefit analysis to illustrate the advantages of SMART-Control

Approach and methodology | Milestones

Milestone	Milestone	Mo
M.2.1	Publication of guide on assessment and management of MAR-associated risks	9
M.3.1	Web-based real-time observation platform running	8
M.4.1	Initial risk assessment tool implemented	12
M.4.2	Web-based real-time monitoring and control capabilities implemented (T2)	10
M.5.1	Real-time monitoring and observation platform implemented and tested at pilot-scheme Pirna	12
M.6.1	Upload of webinars on project website	18
M.6.2	Online user-guide published	20
M.7.1	Project website online	3
M.7.2	Published guide on technology transfer	23

Impact and expected outputs

Main outcome: innovative web-based open source platform including modelling, monitoring and risk assessment tools

→ improve the **management and operation of MAR** facilities and **reduce the associated risks**.

→ **Increase monitoring** frequency of microbial, operational and chemical parameters **using online tools**

→ Show that despite MAR is a nature-based solution, **risks** associated with the implementation and operation **can be managed and controlled**

→ **Demonstrate the concept flexibility** by implementation at different case studies

→ A guideline on the transfer of the SMART-Control approach including a **cost-benefit analysis (CBA)** and a **technological transfer concept**

→ training material including **web-based documentation** and online user-guides; **Workshops in the participating countries** and webinars

Consortium & Contact

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