TERENO

Terrestrial Environmental Observatories

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Helmholtz Centre
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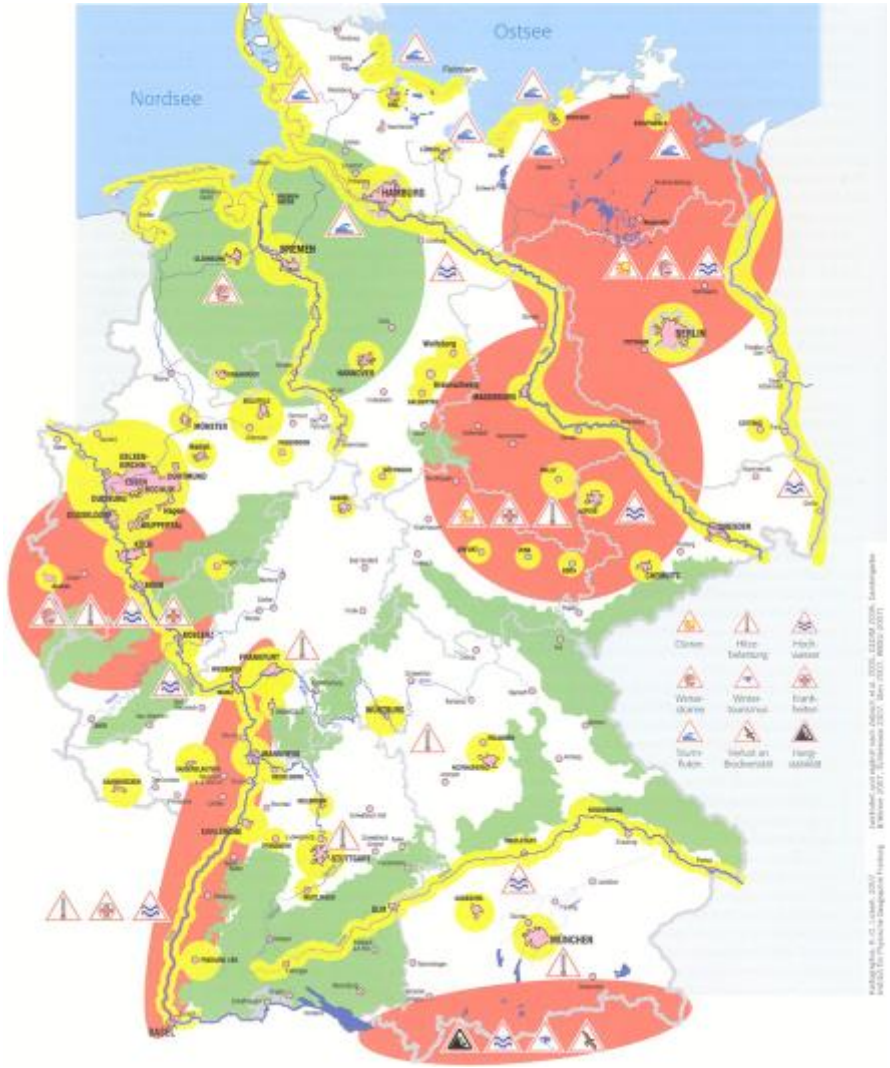
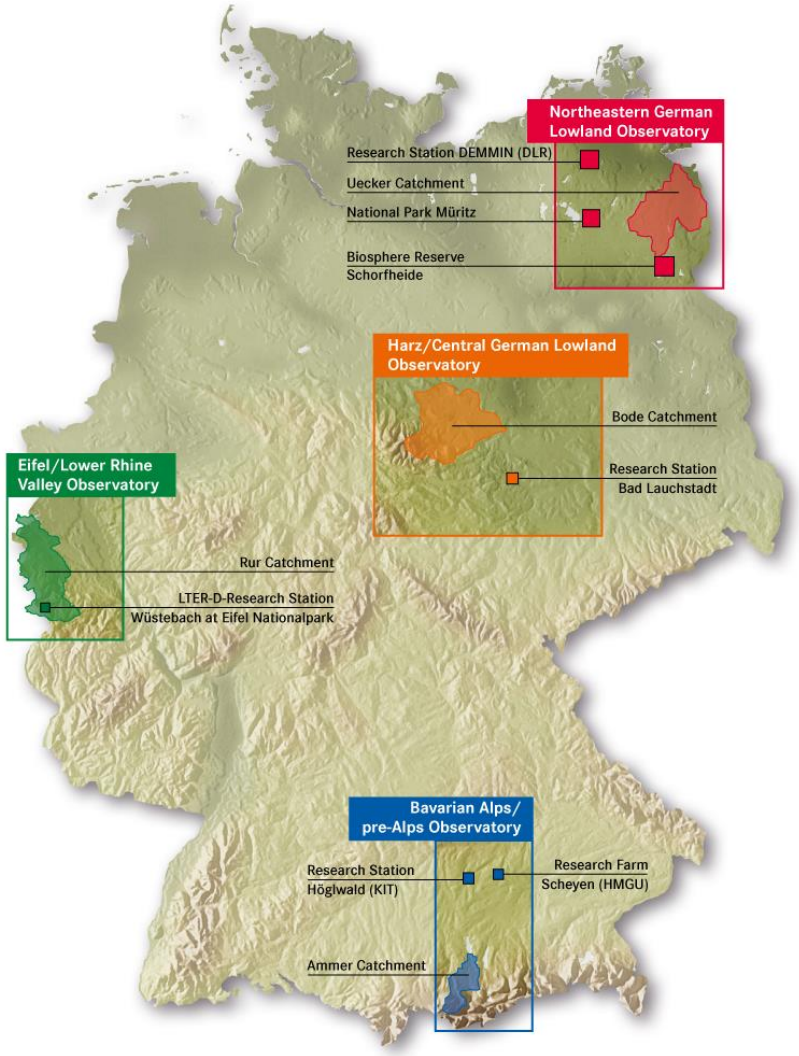
2016 Water JPI Exploratory Workshop, Dublin – 14th November 2016

Climate Change in Germany

TERENO
TERRESTRIAL ENVIRONMENTAL OBSERVATORIES



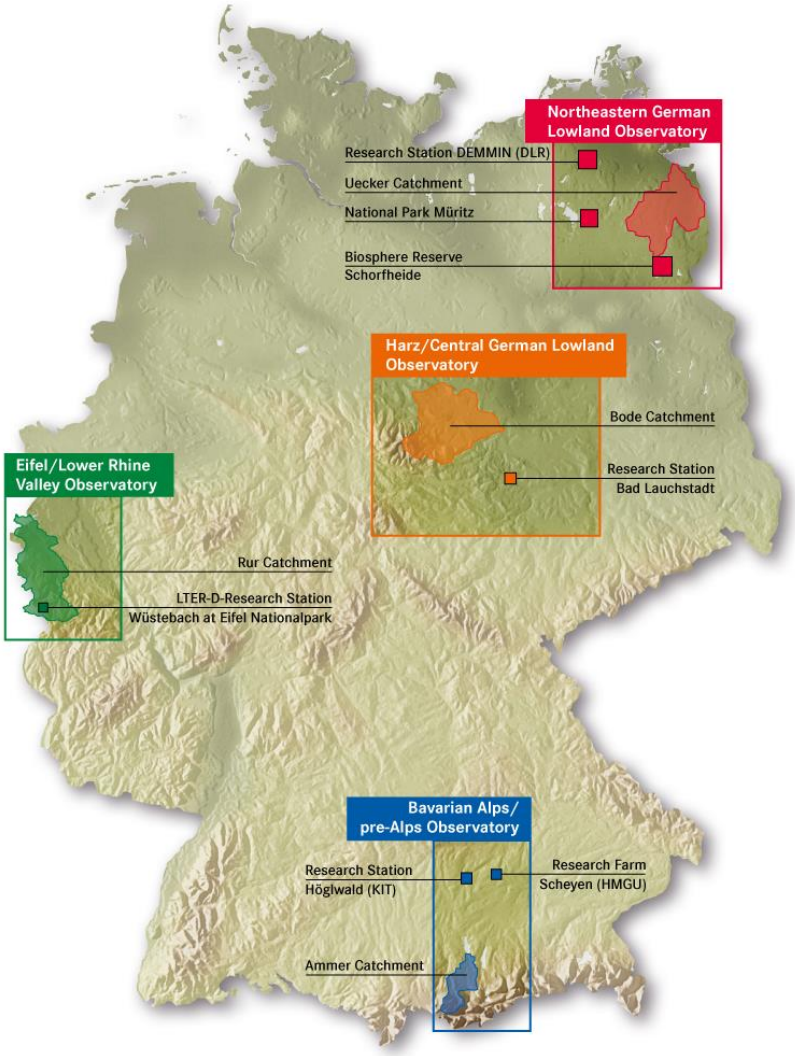


Source: R. Glaser 2008: Klimageschichte Mitteleuropas – 1200 Jahre Wetter, Klima, Katastrophen mit Prognosen für das 21. Jahrhundert.

TERENO – an initiative of the Helmholtz Association

TERENO
TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

- To provide long-term environmental data in a multi-scale and multi-temporal mode
- To study long-term influence of land use changes, climate changes, socioeconomic developments and human interventions in terrestrial systems
- To analyse the interactions and feedbacks between soil, vegetation and atmosphere from the point to the catchment scale
- To determine effective parameters, fluxes and state variables for different scales
- Bridging the gap between measurement, model and management



TERENO – The concept

- To bring together scientists from different scientific communities and to integrate disciplines
- To exploit the availability of novel technologies and high performance computer facilities for terrestrial research
- To establish common measurement platforms as the basis for long term data sets
- To combine observation and experimentation

TERENO Vision and Challenge

Prediciting terrestrial processes from remote information

Multi-scale observations using non-invasive and novel Technologies

SMOS

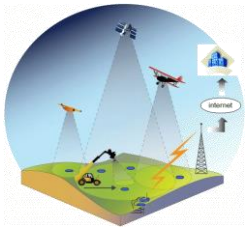
SAR

Weather-Radar

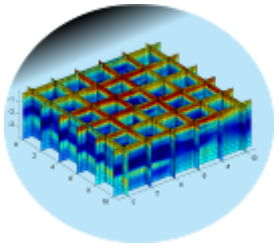
Radio-meter

EM

Data Fusion
Upscaling



Super Computing



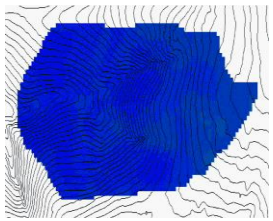
Data management
Visualization

Modelling

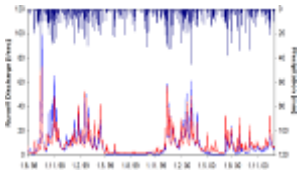
Terrestrial Processes

Evapotranspiration

Soil moisture

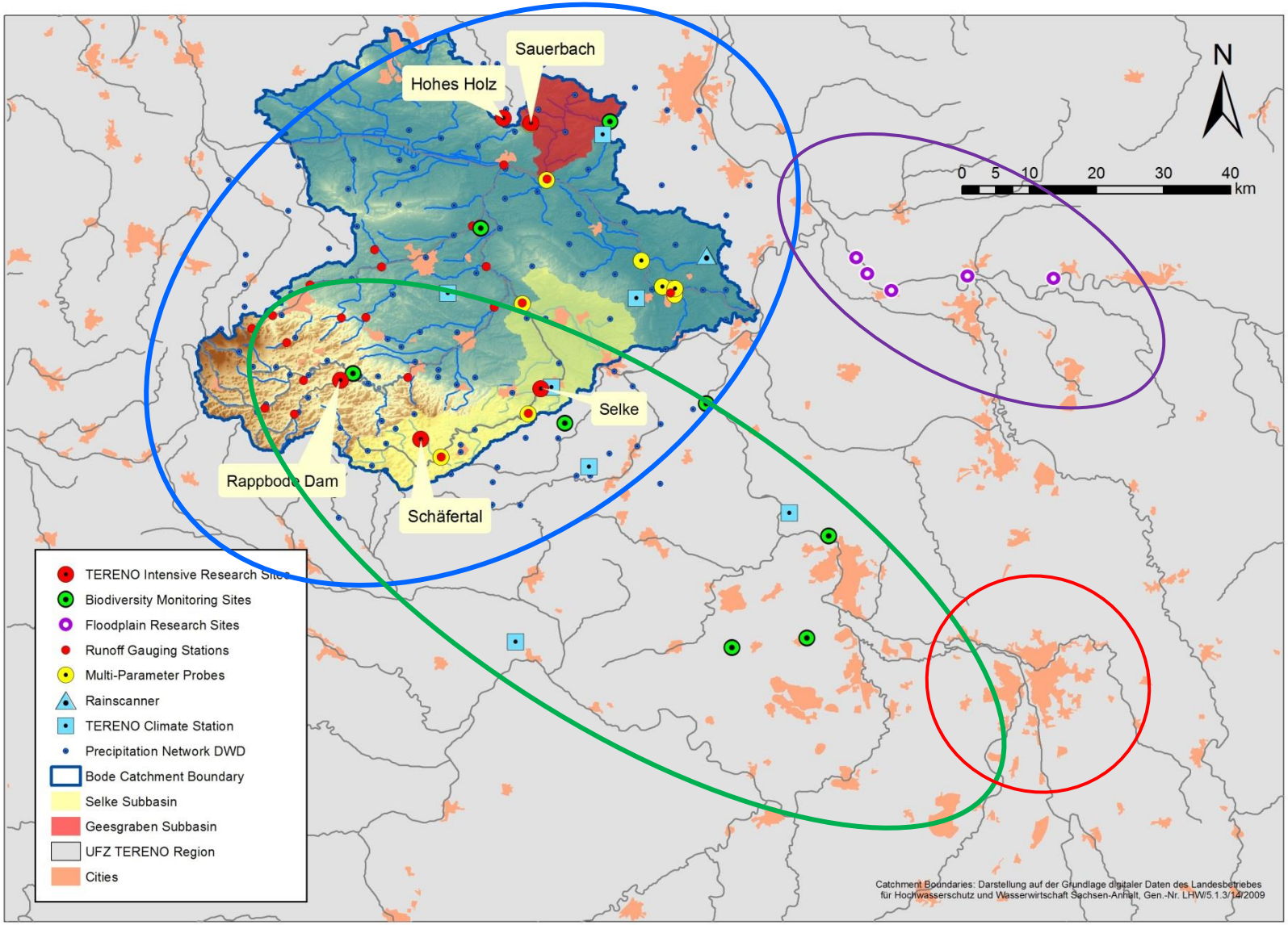


Runoff

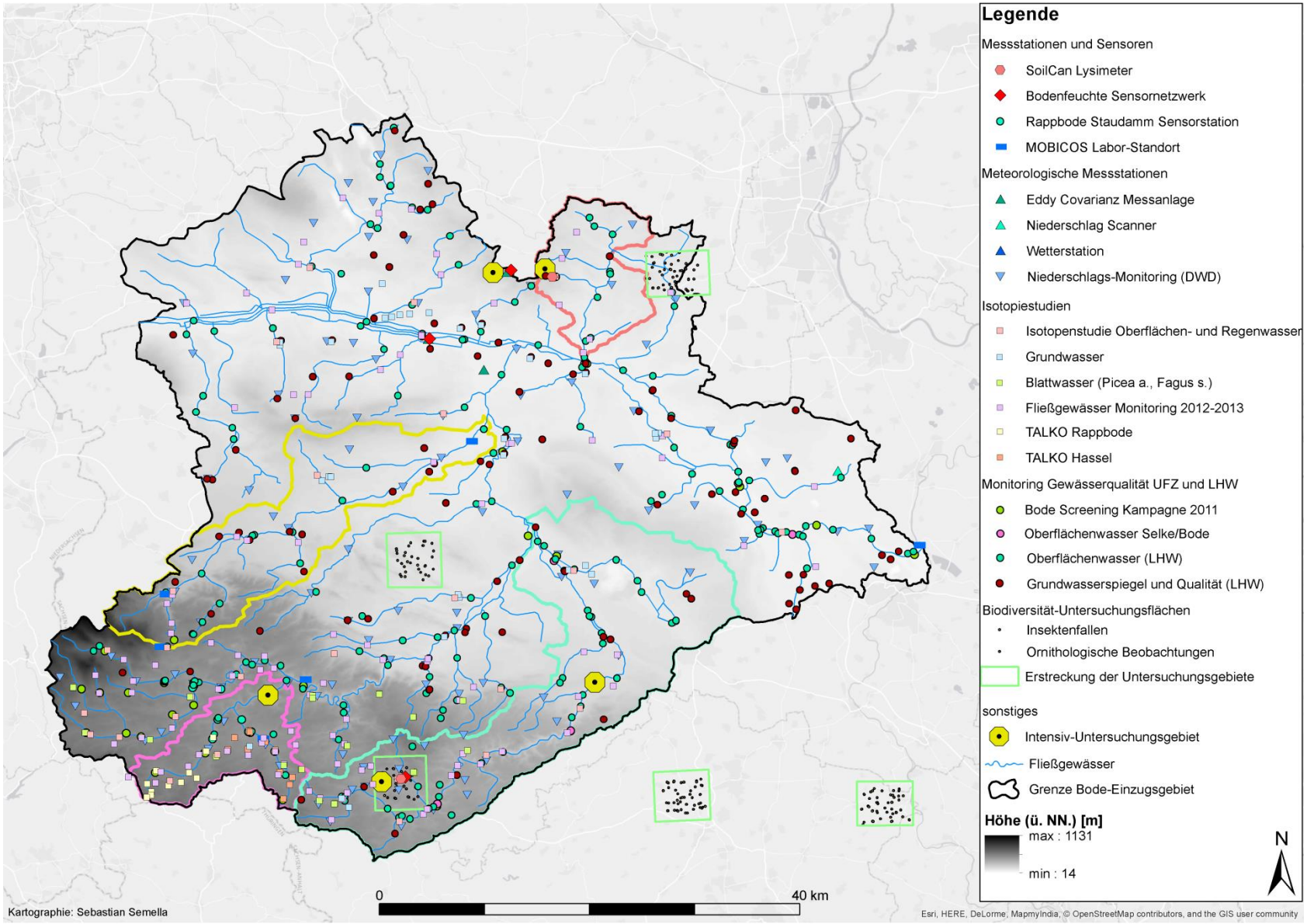


TERENO at the UFZ

The Harz/Central German Lowland Observatory



The Hydrological Observatory Bode



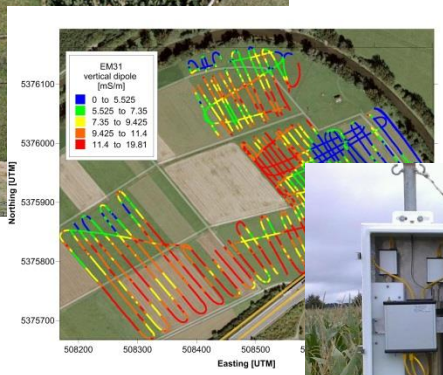
Intensive Site “Schäfertal Catchment“

Understanding the Functioning of the Terrestrial System and Landscape Water Balance Using Novel Observation and Modelling Techniques

→ lysimeters

→ wireless soil water content monitoring network

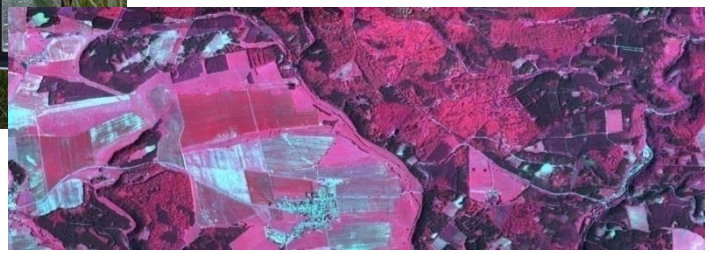
→ geophysical monitoring campaigns



→ cosmic ray probes

point scale

→ airborne & space borne remote sensing (e.g. F-SAR & hyper-spectral RS campaigns)



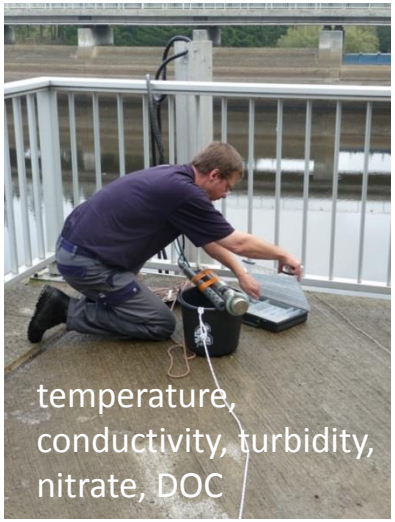
Multi-scale approach for monitoring soil water content (& snow)

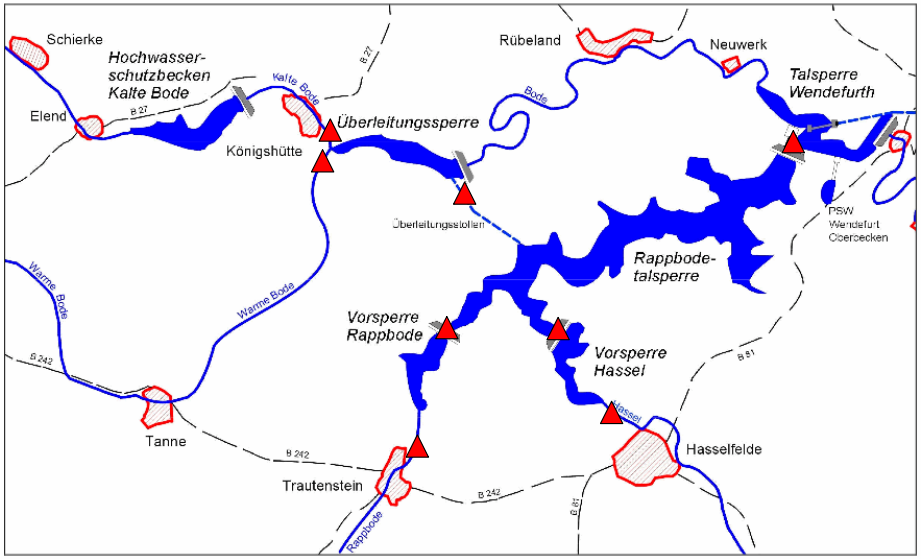
small catchment scale

Intensive Site “Rappbode Dam”

Understanding of dissolved organic carbon flux at the catchment scale

- One of the intensive research sites within the hydrological observatory Bode
- Integrative research on DOC dynamics in surface water systems (impact of land use and climate change on DOC dynamics and transformation processes)
- Close collaboration with local water supply companies

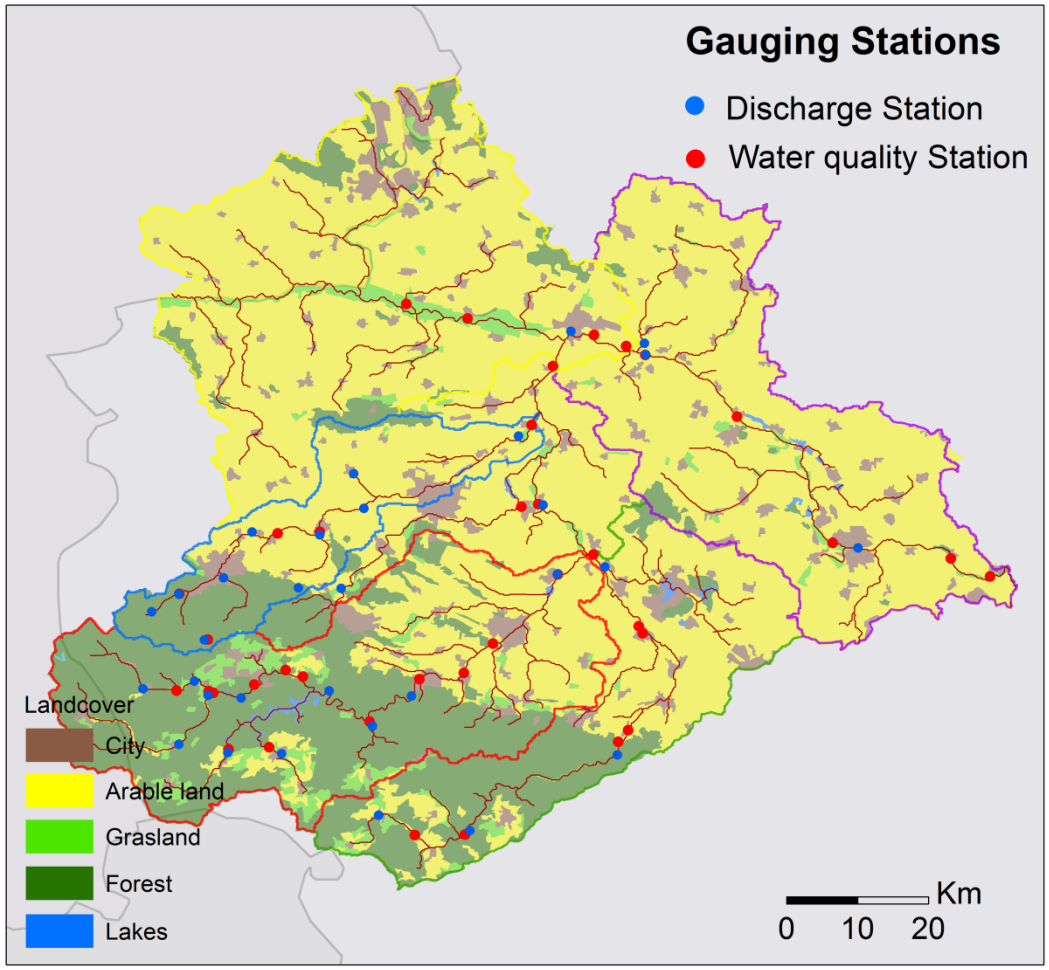




TERENO SoilCan

- Experimental infrastructure to observe long-term effects of land use change and climate change on soils
- Exchange of soil cores within the TERENO observatories along existing climatic gradients and in accordance with the projected climate change
- 126 lysimeters across all TERENO observatories (30 lysimeters at three sites in the Harz/Central German Lowland observatory)
- One of the experimental platforms for the EU-FP7 Project EXPEER (Distributed Infrastructure for EXPErimentation in Ecosystem Research)

Online Water Quality Monitoring at the Catchment Scale



High-resolution data for model development and quantification of processes

(Halbedel & Büttner (2014): Methods Ecol Evol; Rode et al. (2016): Environ Sci Technol

TRIOS UV sensors

YSI sensors

Automatic Samplers

MOBICOS – Mobile Aquatic Mesocosms

- Analysis of mechanisms by experimental manipulations under natural background
- Simulation of global change scenarios
- Control of communities and processes by multiple drivers and their interactions (factorial design)
- Complex on-site analyses for monitoring (effects based analyses, process monitoring)

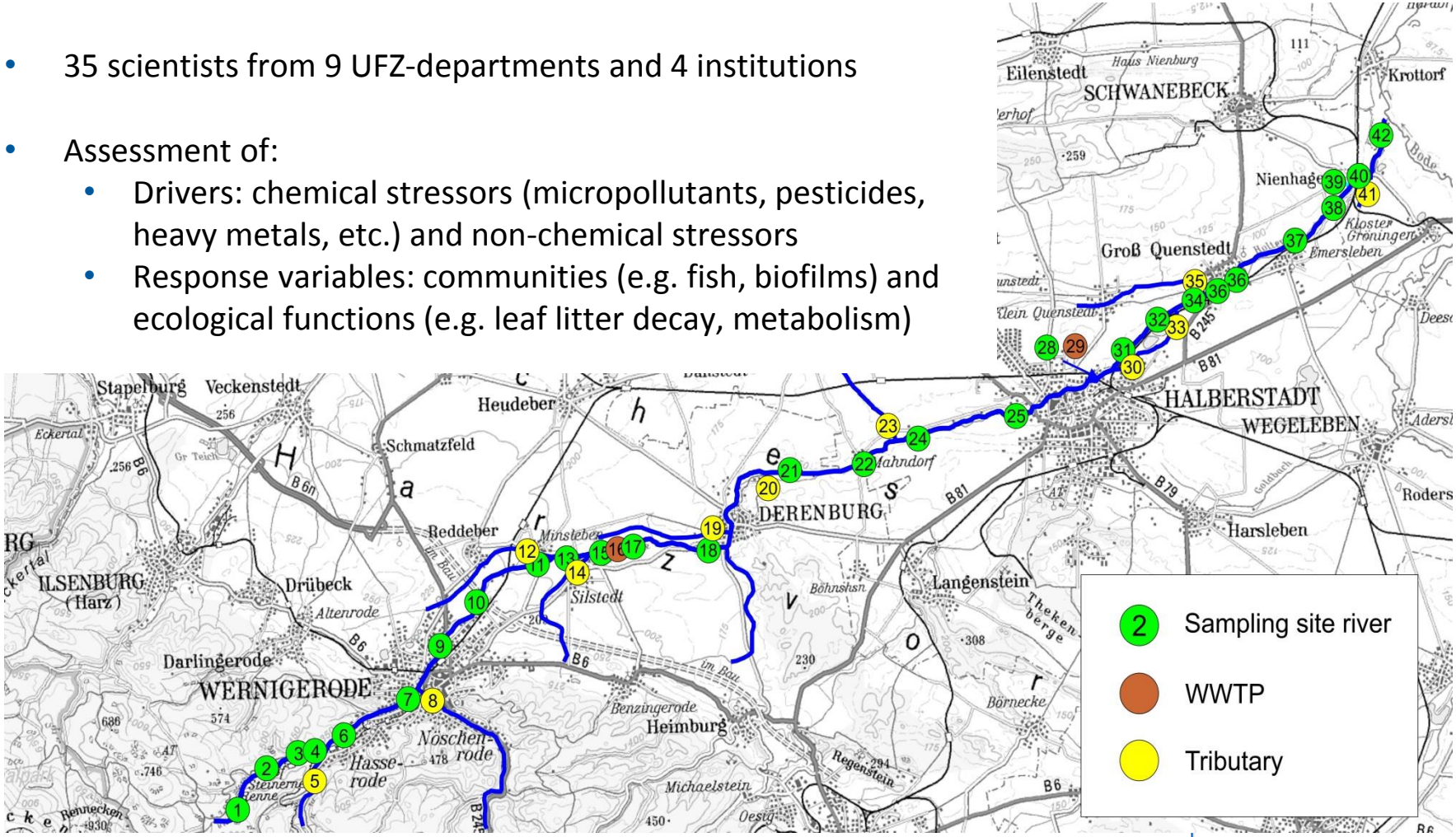
Norf, Weitere, et al.

Key Date Sampling

- A total of 42 sample sites with12 sites at the major tributaries , 2 WWTP's, 3 MOBICOS-sites

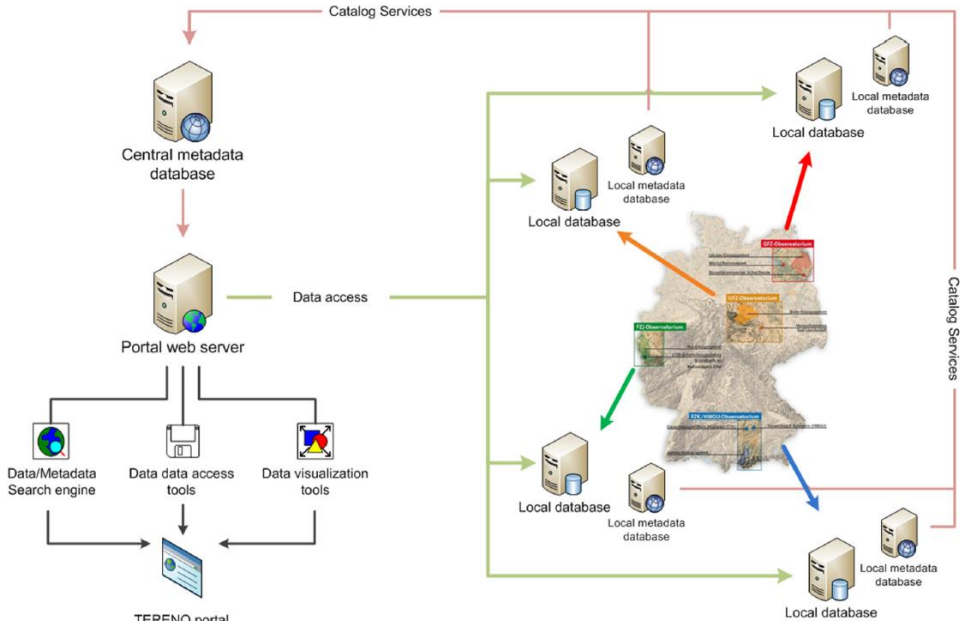
- 35 scientists from 9 UFZ-departments and 4 institutions

- Assessment of:
  - Drivers: chemical stressors (micropollutants, pesticides, heavy metals, etc.) and non-chemical stressors
  - Response variables: communities (e.g. fish, biofilms) and ecological functions (e.g. leaf litter decay, metabolism)



Brauns, Bärlund, Borchardt, et al.

TERENO Data Portal



HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ

TERENO and international networking

TERENO
TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

CRITICAL ZONE EXPLORATION
NETWORK

ICOS integrated carbon observation system

ExpeER
Ecosystem Research

eLTER
ESFRI

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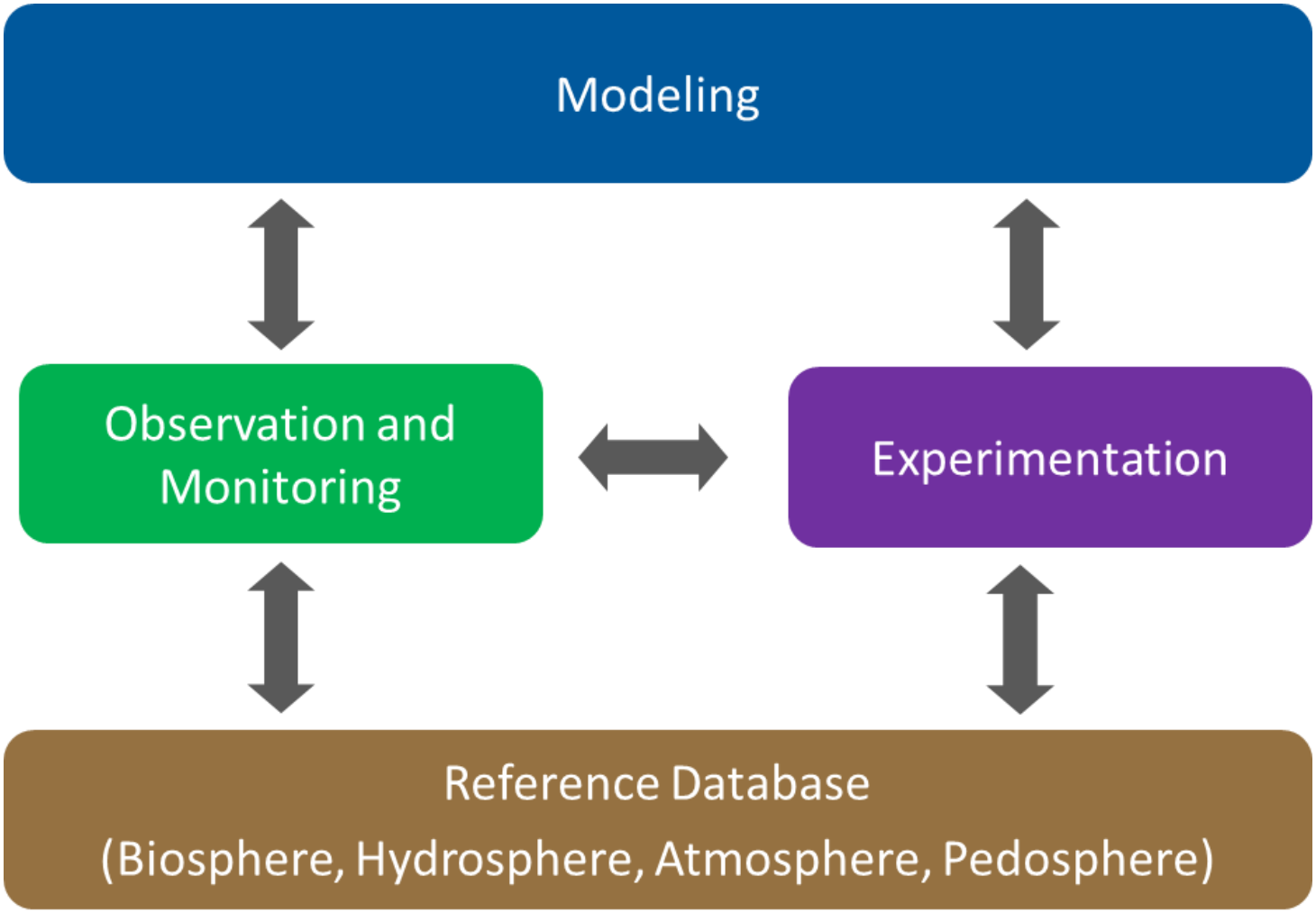
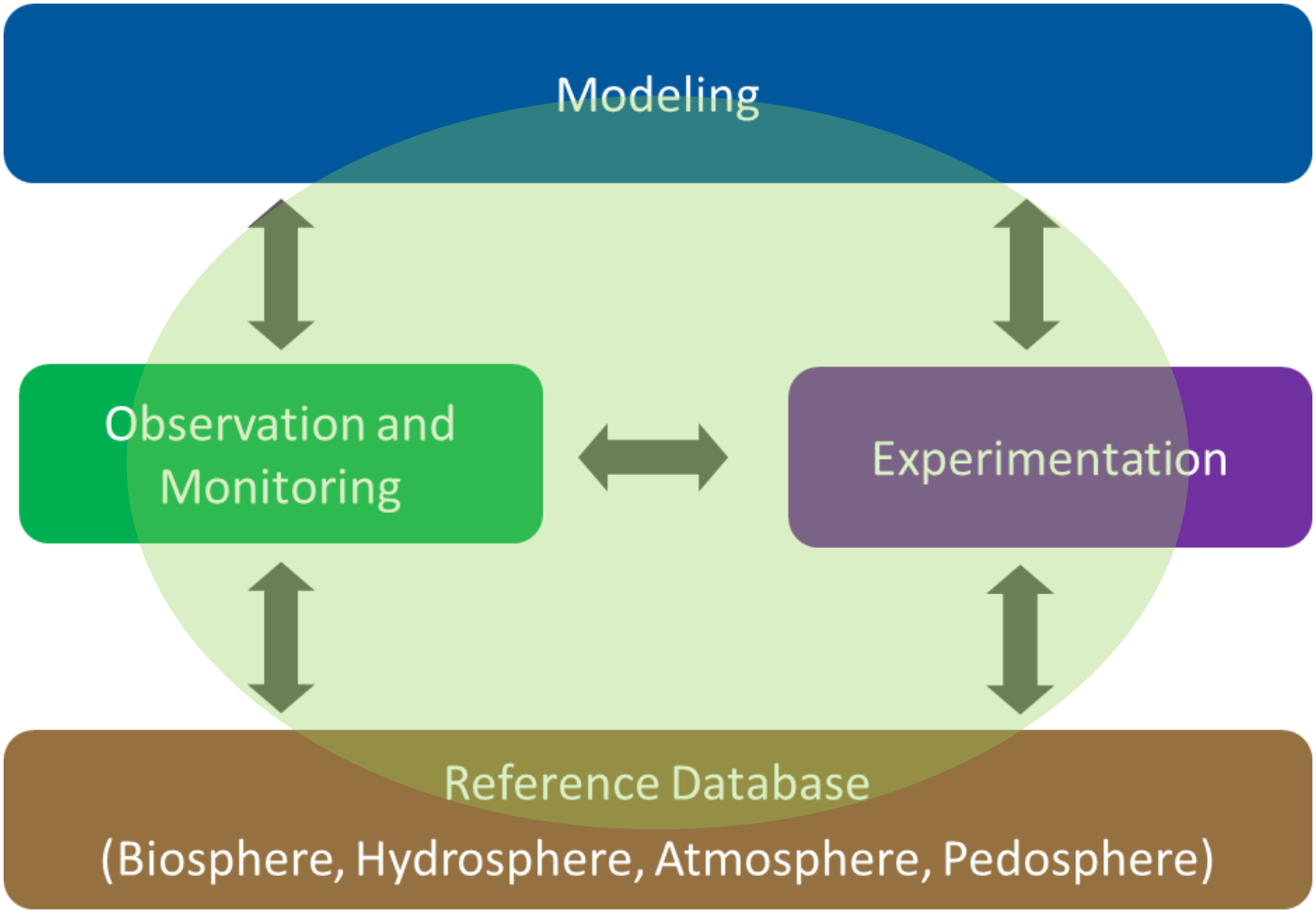
RESEARCH – UFZ

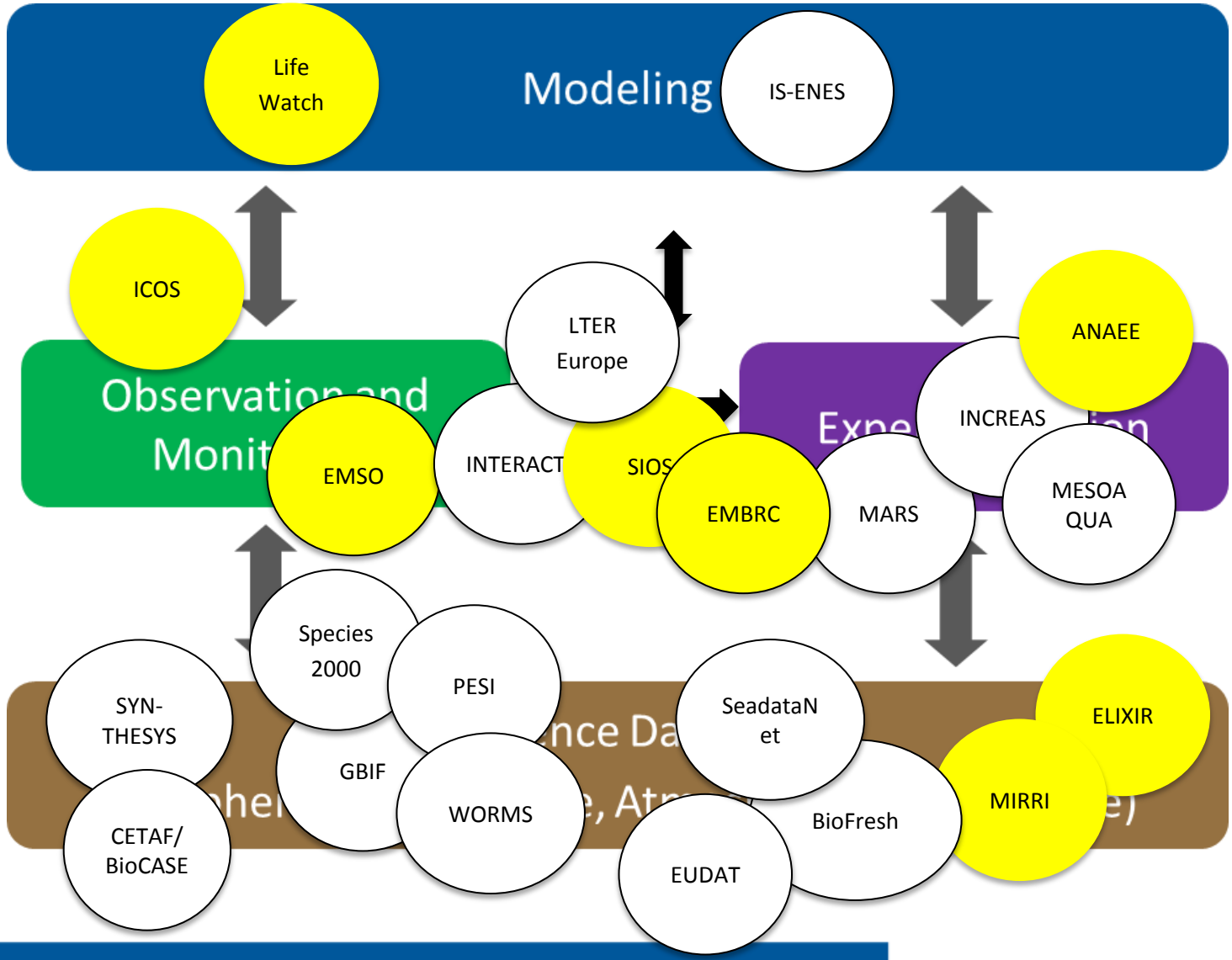
How to conceptualize?



Integration

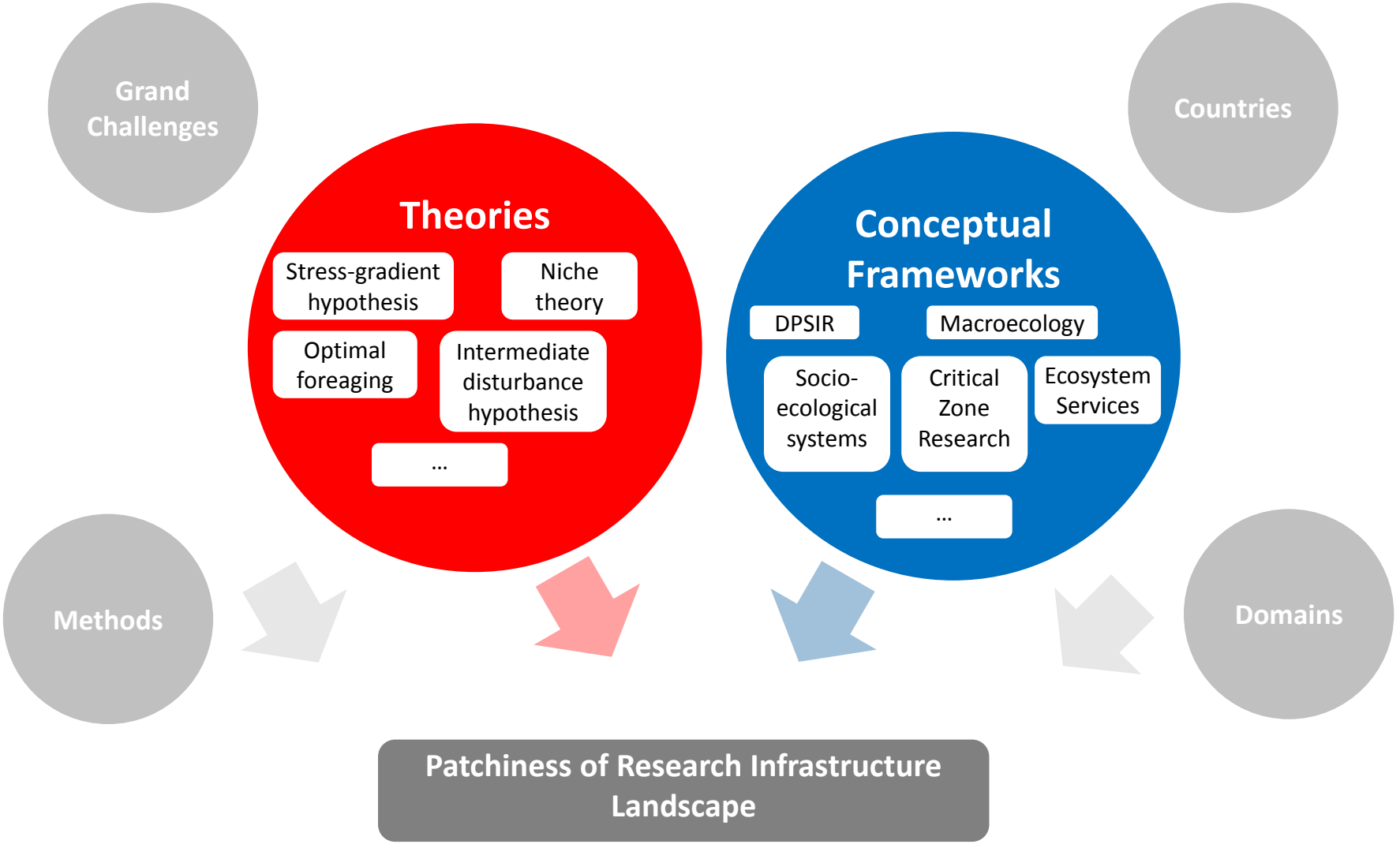


Integration – Quo vadis

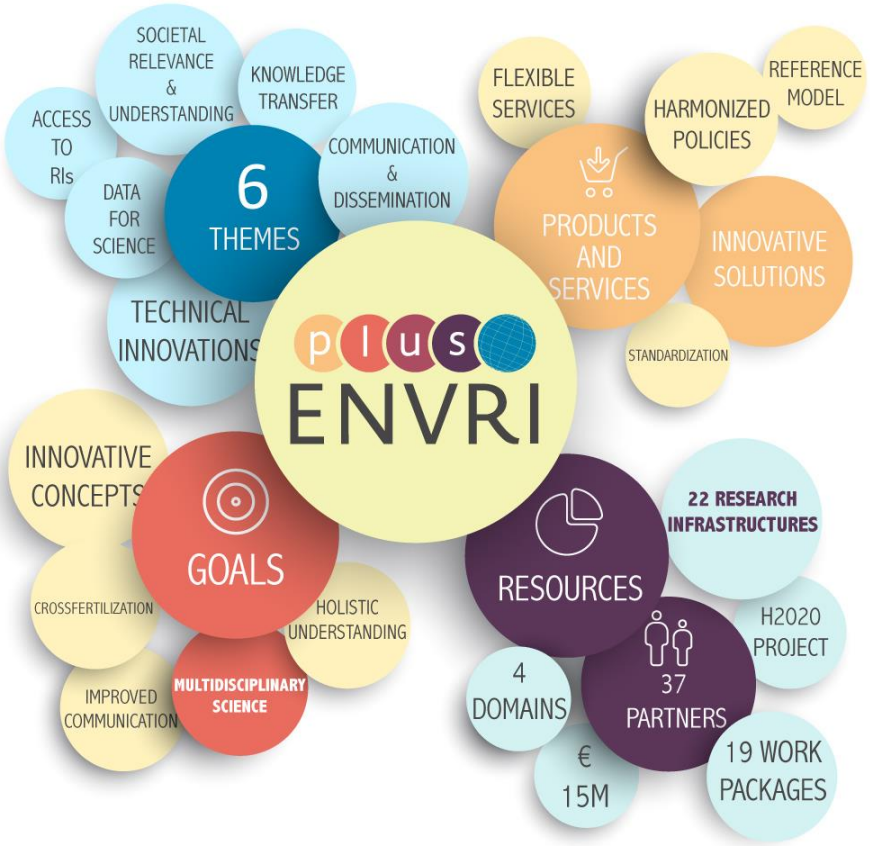


Mirtl, 2016

Reasons for Diversity –
The Drivers of Research Infrastructure Landscape



ENVRI+

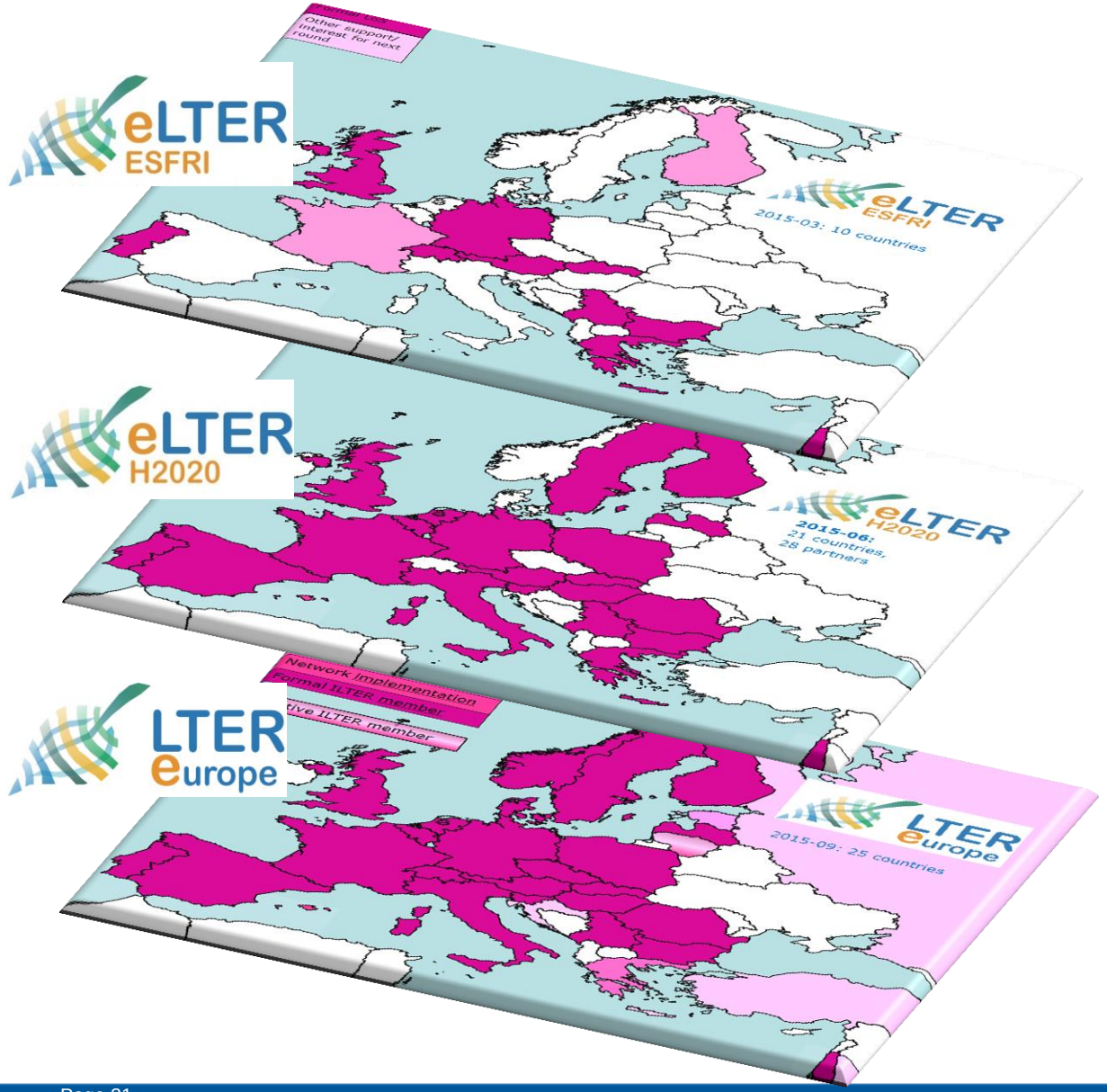


"ENVRIplus has its focus on coordination to structure the scientific community and to reduce the fragmentation in the environmental RI landscape."

"Collaboration is the only way forward to address the Global Changes facing today's society."

www.envriplus.eu

ADVANCE_eLTER ESFRI Emerging Project



ADVANCE_eLTER ESFRI emerging project

11 initiating countries

45/80/**130** eLTER **Sites** (MS, RS)

5/10/**30** eLTSER **Platforms**

eLTER H2020 Project 2015-2019

21 LTER countries,

28 partners

162 data providing sites

Network of formal national networks

25 countries

400 LTER Sites

35 LTSER Platforms

European data platform for hydrological observation and experimentation

- Access to high quality data series of key hydrological fluxes and states
- Standardize and harmonize data
- Exchange experience in operation of equipment
- Test and validate new measurement technologies (e.g. Cosmic-ray soil moisture sensors, on-site stable isotope analyzers, wireless sensor networks)
- Support the calibration and validation remotely sensed data products by serving as Cal/Val sites (e.g. SMOS, SMAP, Sentinel)
- Support the joint definition and operation of hydrological field experiments
- Provide information on mobile equipment that can be used in cooperation with other institutions (e.g. hydrogeophysical equipment, mobile ECs, UAV, …)
- Define joint projects to mine and interpret existing spatial-temporal data of hydrological states and fluxes (co-mentoring of PhD-students)

Meeting between TERENO/HOBE/HOAL in October 2016

Synergies with the Water JPI Theme 5

- Promoting and supporting the networking of experimental catchments at the European Scale
- Activities towards a harmonization and standardisation of hydrological monitoring
- Establishment of hydrological observatories in the Mediterranean (Spain, Italy, Greece, Israel)
- Data provision
- Strengthen the hydrological research in the context of integrated environmental monitoring