



## eLTER – Site Categories

*Motivation and status of options for revisions and more detailed specifications*

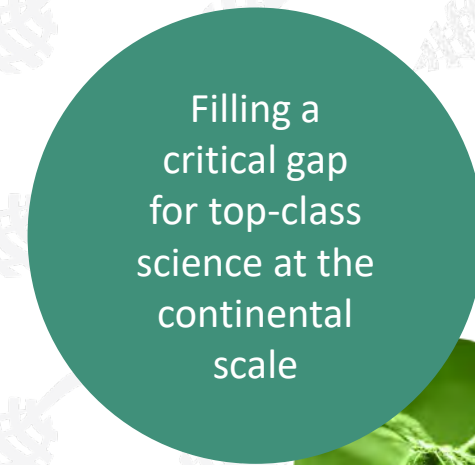
**LTER Germany conference 18<sup>th</sup> March 2022, virtual space**

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UFZ, Germany & EAA, Austria

**& the entire editorial group**

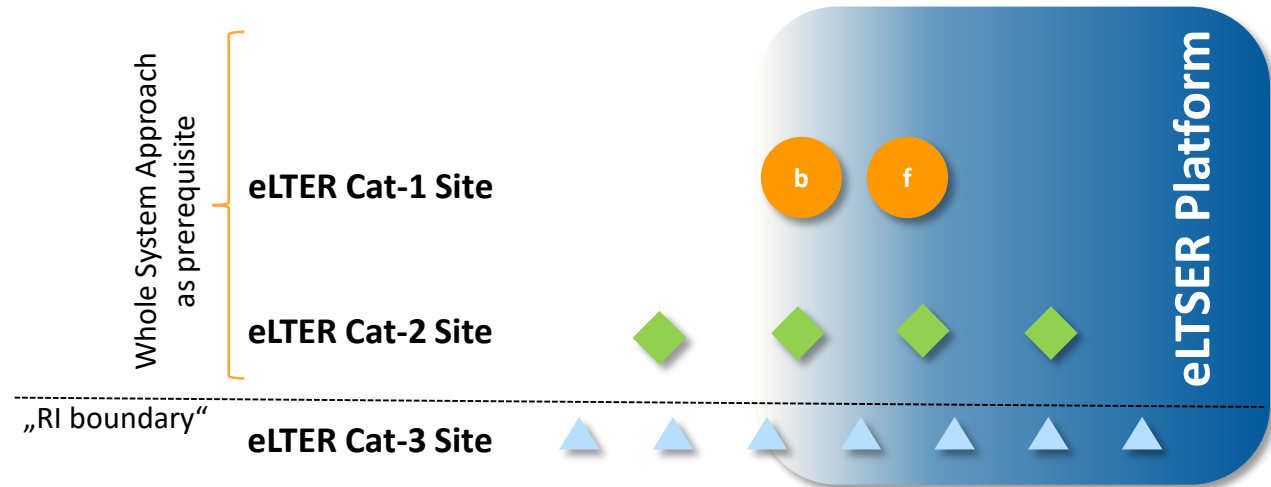
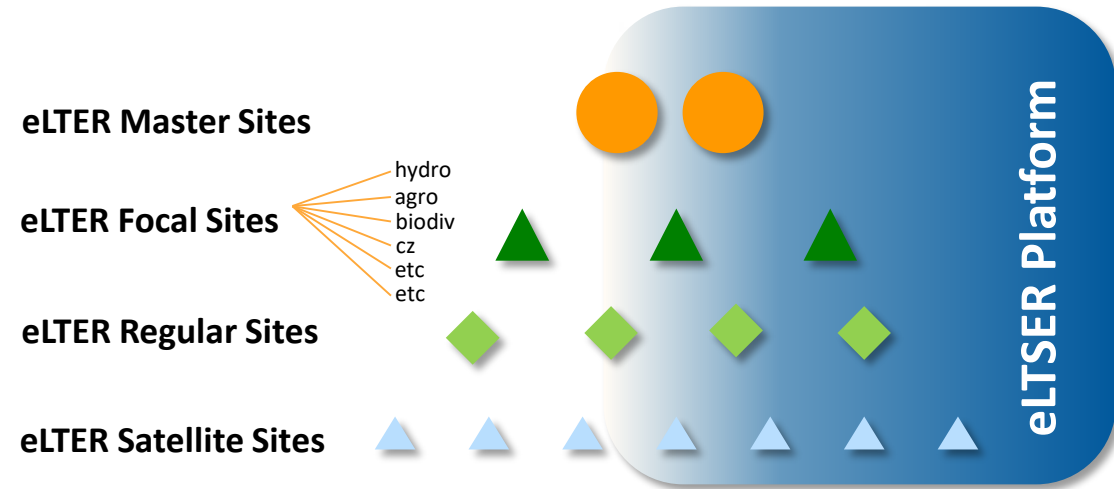
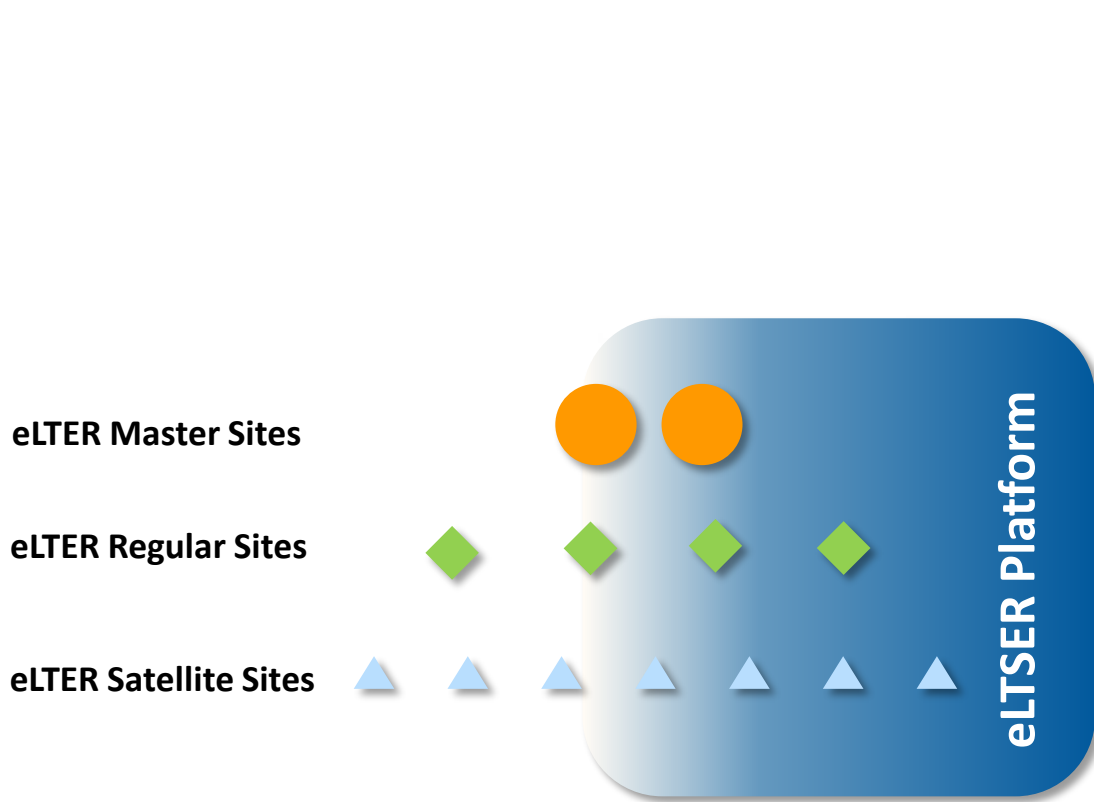
→ dedicated slide



# Why site categories

- **Facilitating the simple screening and pre-filtering** of sites concerning for a wide range of purposes
  - their “quality” and focus in terms of scope, involved disciplines, instrumentation, activity level, responsiveness etc.
  - relevance for science questions
  - usability in concrete projects
  - networking with related monitoring networks.
- **Consistent of grouping of sites across biomes** according to generic characteristics like level of instrumentation, number of standard observation variables, disciplinary scope and size (all applying whole system approach)
- Questions related to **rough cost assessment** (the hard site characteristics largely decide on costs per category)
- **Pragmatic grouping considering thematic priorities:** that most sites were originally established and are still operated with certain thematic priorities

# Options: expansion vs. simplification

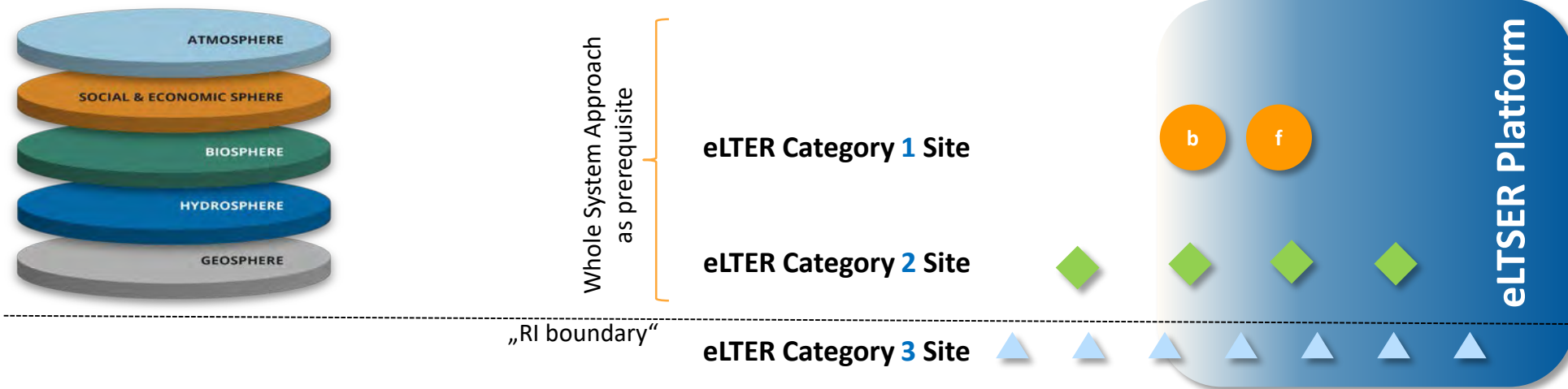


# Staged approach for category specification

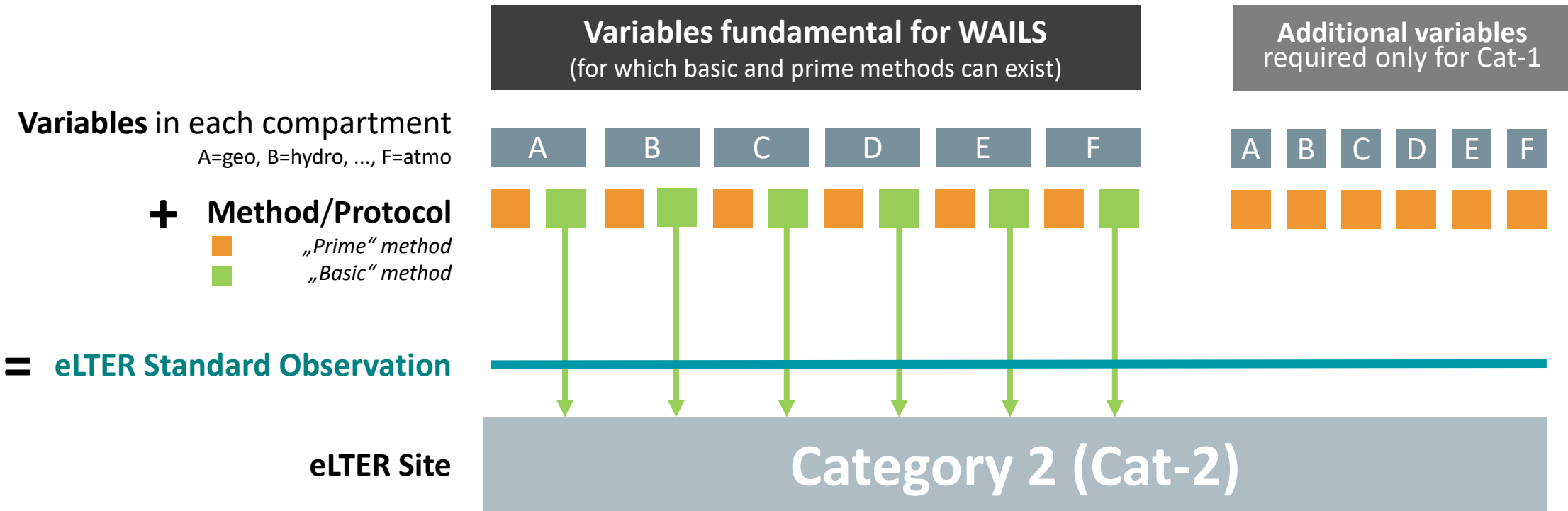
- Hard criteria
  - overall purpose: **transparent and quantifiable characteristics** for correct assignment (where no compromises can be made)
  - **simple to control** in a labeling process
  - enabling **accurate cost assumptions**
- Customizable characteristics
  - overall purpose: leave **space within certain limits, where no general rule is technically possible or agreeable**
  - characteristics, where a certain range of options exist (e.g., spatial design)
  - documentation and justification
- Guidelines and recommendations
  - overall purpose: give **additional explanations and background information** to secure understanding & buy-in and facilitate assignment
  - answers to frequently asked questions concerning application of the category
  - possibly a collection of typical sites for the category

# eLTER site categories, status 2022-03-18

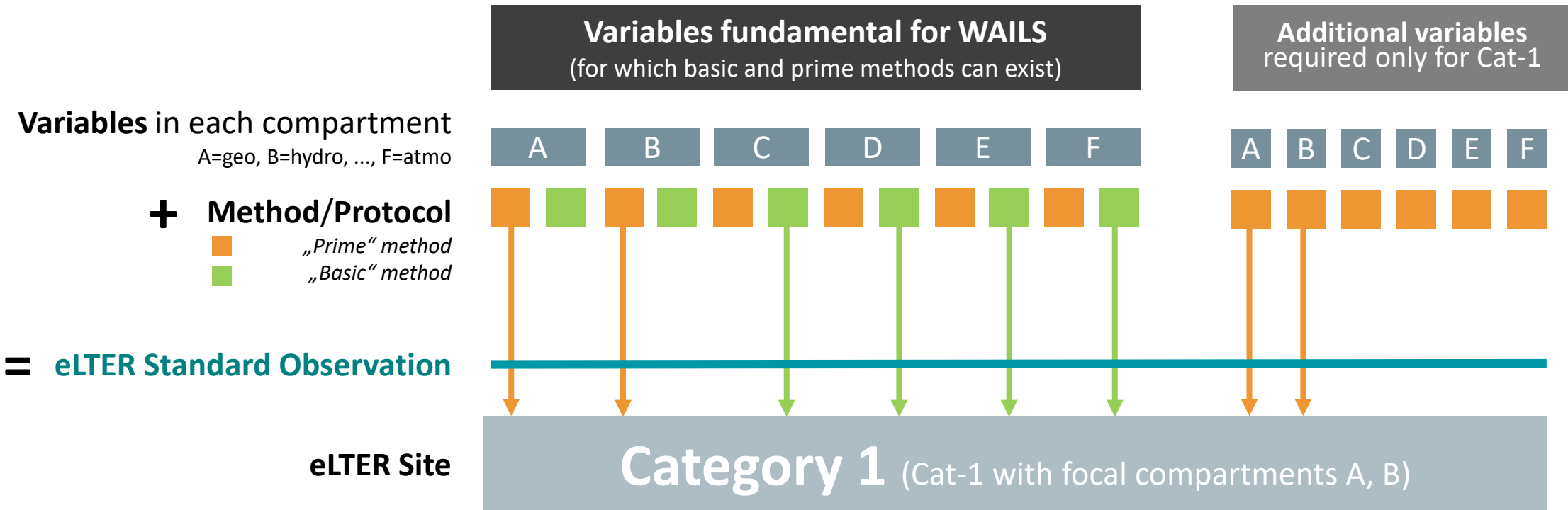
- Numbering compliant with train ticket system, ICOS...
- Cleaning of a maximum number of terms: Categorization leads to Categories (no levels, classes misleading adjectives...)
- RI boundary marked by the „Whole system approach“



# Linkage between eLTER Standard Observation Method Levels and Site Categories: *Example for Category 2 Site*



# Linkage between eLTER Standard Observation Method Levels and Site Categories: *Example for Category 1 Site*



# Standard Observations – Prime and Basic Methods and Protocols

## Examples – not agreed yet!

Variable	Basic	Prime
Soil moisture	<ul style="list-style-type: none"> <li>• few soil moisture sensors should be operated (e.g. parallel to the weather station) providing rough impression about range and dynamics of soil moisture</li> <li>• TDR</li> <li>• 2 repetitions, 3 depths (5, 20, 50 cm)</li> <li>• Temporal resolution: 10 min</li> </ul>	<ul style="list-style-type: none"> <li>• Measurement of soil moisture beyond point scale</li> <li>• Cosmic-Ray neutron probes covering representative locations</li> <li>• COSMOS-Europe protocol</li> <li>• Number of sensors depends upon site characteristics</li> <li>• Temporal resolution: continuous counting, log total counts every 15 min</li> </ul>
Streams/Rivers - Discharge	<ul style="list-style-type: none"> <li>• No direct measurement required</li> <li>• Application of hydrological model (central service, to be discussed) resp. provision of data from national monitoring programs</li> </ul>	<ul style="list-style-type: none"> <li>• V-notch weirs + CTD probes (parallel measurement of conductivity, temperature and depth)</li> <li>• Temporal resolution: 15 min</li> </ul>
Net Ecosystem Exchange – CO <sub>2</sub> flux	<ul style="list-style-type: none"> <li>• No direct measurement required</li> <li>• Assessment of carbon stocks by campaign-based sampling of carbon pools. Energy balance can be estimated based on climate monitoring and modeling.</li> </ul>	<ul style="list-style-type: none"> <li>• EC-Station</li> <li>• ICOS protocol</li> <li>• Temporal resolution: 10 min</li> </ul>
Biotic diversity - Habitat structure, vegetation/plant phenology	<ul style="list-style-type: none"> <li>• Remote sensing: Sentinel imagery or equivalent 10-20 m for habitat mapping</li> </ul>	<ul style="list-style-type: none"> <li>• On-site ground vegetation surveys</li> <li>• agreement on common protocol required!</li> </ul>



# Cat-1 Sites: Hard criteria

**Teaser:** Highest site category. The holistic approach at Cat-1 Sites covers all ecosystem compartments and all variable groups of the eLTER Standard Observations with the basic method. In addition, Cat-1 specialize on at least 2 compartments, where the prime method is accomplished.

## Hard criteria

- Whole system approach implemented
  - observational design reflecting WAILS
  - all system compartments covered with basic method
- Specialization beyond basic method, which justifies Cat-1: For at least two compartments/layers the prime method of Standard Observation variables is achieved
- Secured capacity for Transnational (physical) Access (TA), Remote Access (RA)
- Guaranteeing Virtual Access (VA)
- All-year access guaranteed (road infrastructure or other infrastructure)
  - *Remark: in principle the resolution in time, needed technical maintenance etc. leaves hardly any space NOT to require the possibility of all-year access (in which way ever it is granted). This does not suggest that any sub-area of a site needs to be permanently accessible, but the site as a such and the location of the facilities that need to be permanently operated and controlled*
  - Stable power supply with reserves for potential additional TA activities*
- Site coordinator, data manager and responsible director in the operating institutions appointed
- Long-term operation bindingly agreed by the operating institution (options to be decided: 5yrs, 10yrs, 5-10 yrs...?)

# Cat-2 Sites: Hard criteria

**Teaser:** Putting WAILS into practice, Cat-2 Sites observe and investigate the whole ecosystem at a basic level. This is evidenced by covering all ecosystem compartments and their related Standard Observations variables measured with the basic method.

## Hard criteria

- Whole system approach implemented
  - observational design reflecting WAILS
  - all system compartments covered
- Standard Observations variables covered across all compartments with basic method
- Supporting Remote Access (RA)
- Guaranteeing Virtual Access (VA)
- Secure physical access for the needed Standard Observations (installation, technical maintenance...)
- Appropriate power supply
- site coordinator and responsible director in the operating institutions appointed
- long-term operation agreed by the operating institution (options to be decided: 5yrs, 10yrs, 5-10 yrs...?)

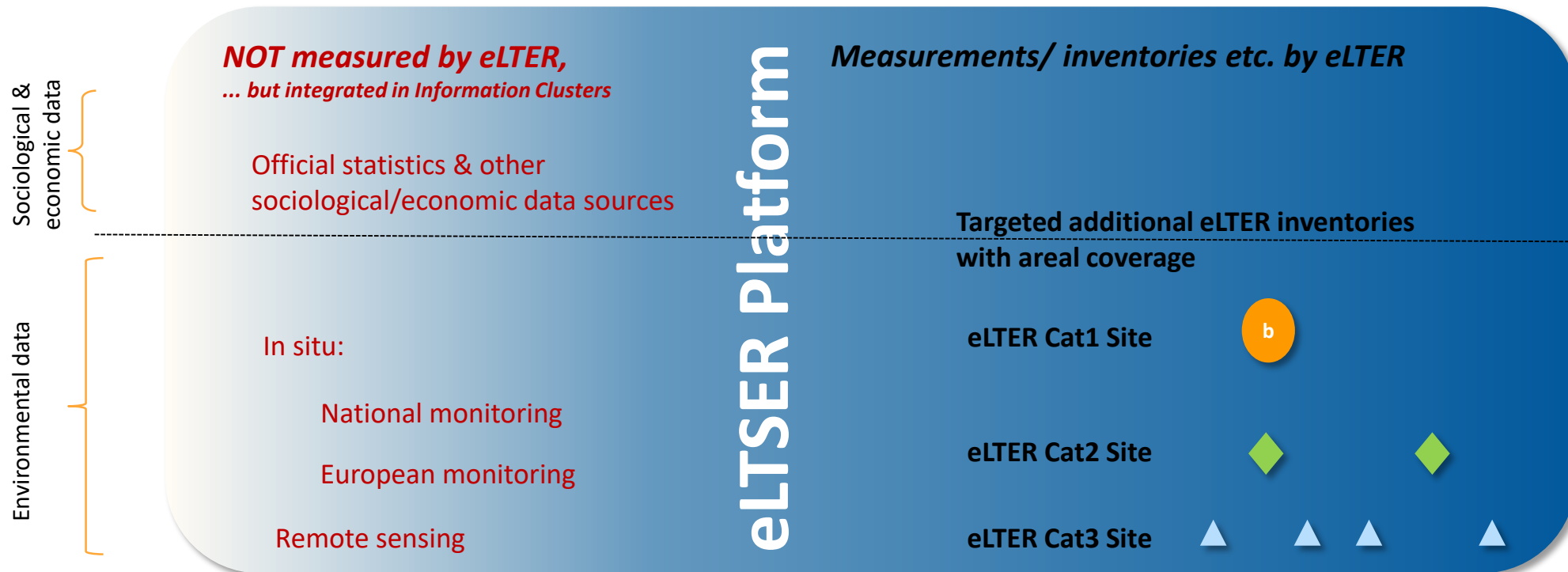
# Cat-1 & Cat-2 Sites: Customizable characteristics – SPATIAL DESIGN

- Closely linked to the question of the size
- Can be
  - a compact spatial unit
  - a cluster of sub-units
- Possible need for specific terrain characteristic/property for certain topics
  - e.g.: “(sub-)catchments” for hydrological studies, where the absolute size of the catchment is of subordinate importance
  - In such cases the spatial design might form part of the methodology to measure a given variable (→ SOs specification).
- Mandatory reviewed justification

# Cat-1 & Cat-2 Sites: Customizable characteristics - SIZE

- In general: size has to “be **appropriate for...**”
- Needs to be **explicit and scientifically justified** (□ review)
- Collect **for each compartments information that is representative of the site** (the chosen geographical boundary).
- The spatial extent also **determines the required effort** for the measurements (# replications, co-location etc.).
- Consider the **required size for possible RIs co-location**
- Space needed to accommodate the amount of observations incl. needed **replicates and reference points**, - plus some **reserve** in case of catastrophic events.
- A minimum of 0,75 km<sup>2</sup> was discussed, but finally dropped as “hard criterion”.
- **Mandatory reviewed justification**

# eLTER RI Design – eLTSER Platforms



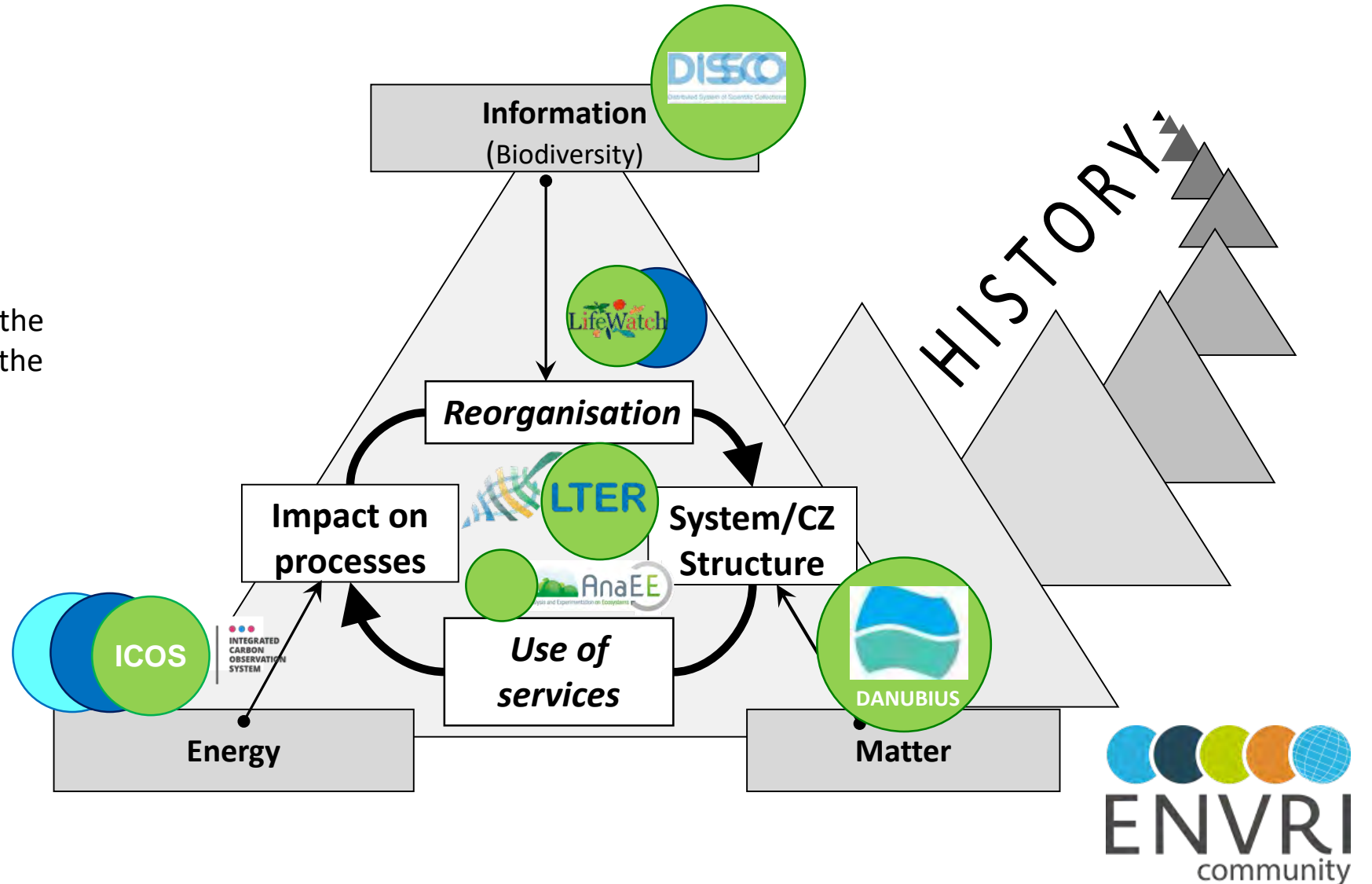
## Comments

- To achieve WAILS at the landscape level LTSER Platforms need sociological, economic and environmental data with full areal coverage and at compliant scales/resolution
- Site based reserach (=> 1 eLTER Site) is needed in addition
  - for formulation of societal challenges
  - to be the counterpart in true cross- and transdisciplinary research
- SERVICE ASPECT: YES, anyone can use official statistics etc. but it is an eLTER service to (centrally purchase, ) collate and provide via an integrated database
- Distinction between environmental and sociological/economic data for technical reasons (landscape of sources...)

**Nicht präsentierte Bonus-Material zum Whole System Approach  
(WAILS´)**

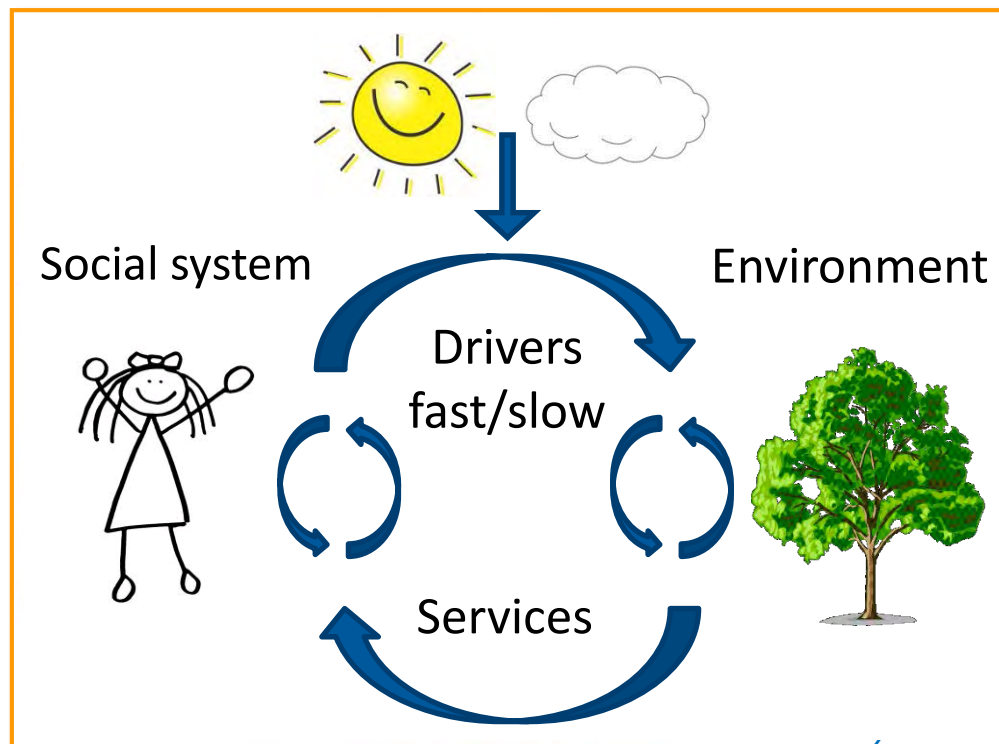
# eLTER's role in the environmental RIs landscape

ENVRIplus landscape slide used in the ESFRI discussion in preparation of the 2018 Roadmap

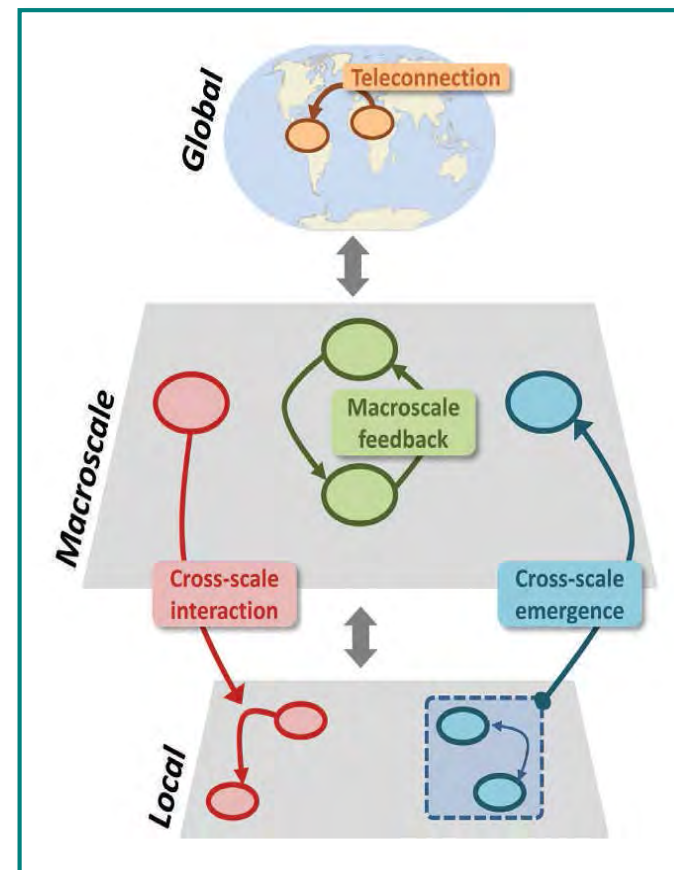


*Kutsch et al. 2001, modified*

# Whole-system approach for in-situ research: Elements



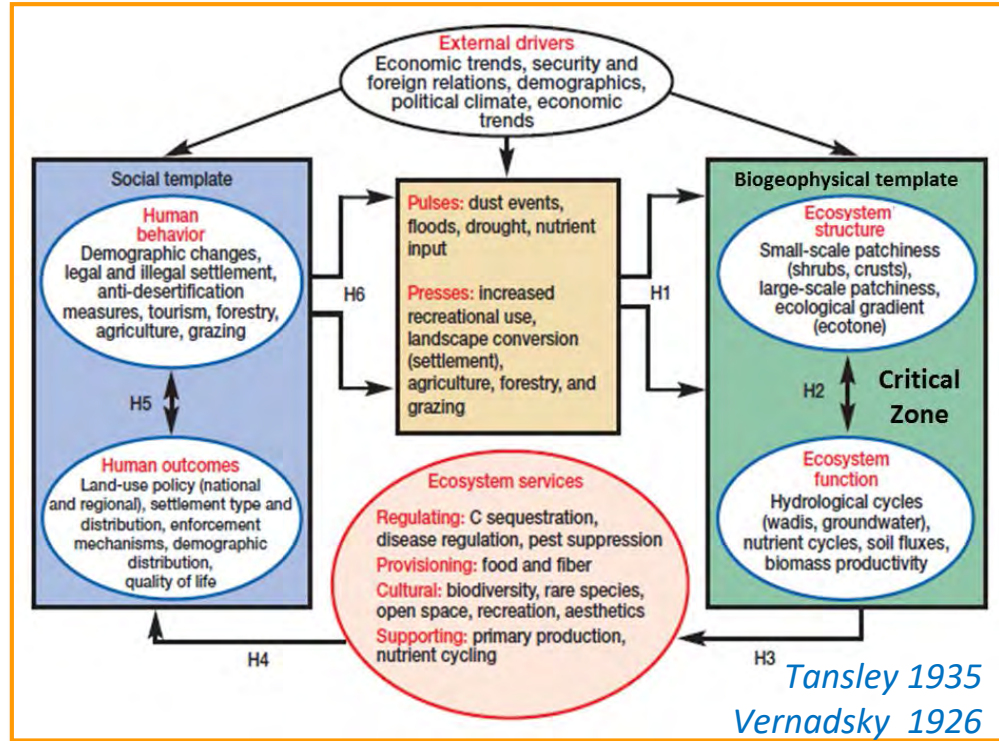
*Pulse Pressure Dynamics – PPD  
Collins et al, 2011*



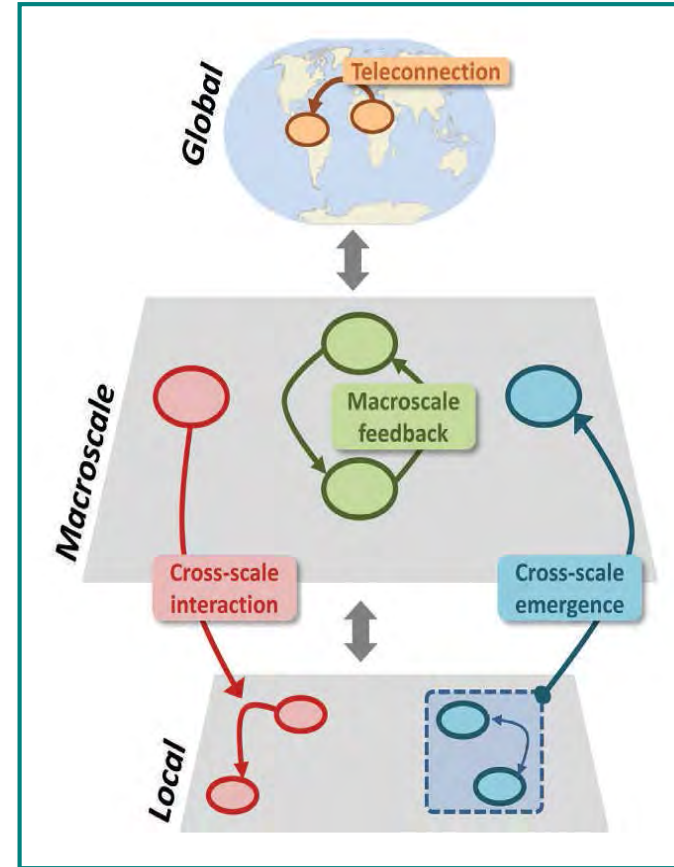
*Macrosystems Ecology  
Heffernan et al, 2014*



# Whole-system approach for in-situ research: Elements



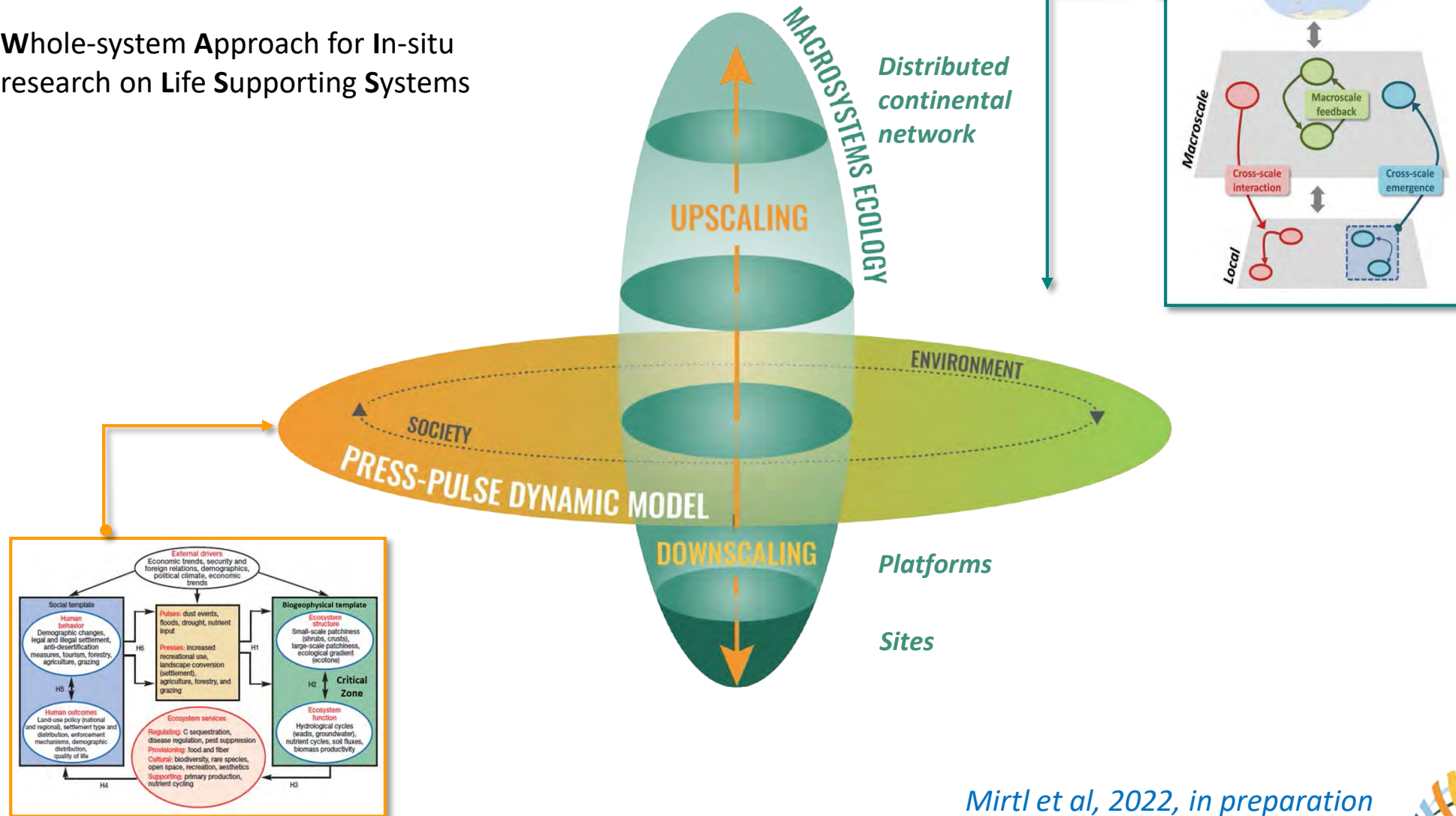
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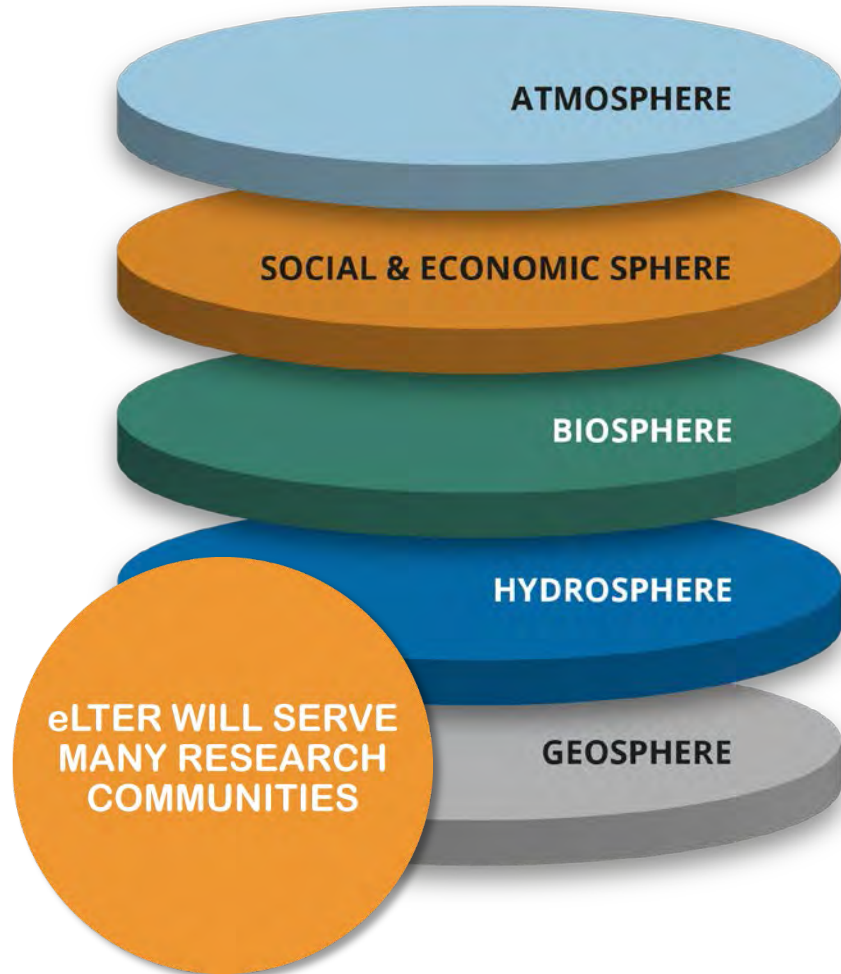
# Combination of Press-Pulse Dynamic Model and Macrosystems Ecology = WAILS

Whole-system Approach for In-situ research on Life Supporting Systems



Mirtl et al, 2022, in preparation

# „Whole System“-Approach: Cross-disciplinarity addressing the Life Supporting System



## DESIGN


- Hierarchy of site categories
- Various levels of
  - instrumentation
  - spatial complexity



## SERVICES

- Basic site infrastructure
- Information Clusters
  - Standard Observations on site (“EEVs”)
  - Multiple other data sources (RS, modelling)
- Data access
- Analytical tools, virtual labs
- Training

Continuous long-term operation of ~200 innovative hubs



**If you want to go fast go alone,  
if you want to go far go together.**

An old African proverb

[www.elter-ri.eu](http://www.elter-ri.eu)

