

Extreme transformability.

Exploring systemic solutions to climate high-end scenarios (HES) in the Iberian Peninsula

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Context:

- As the possibility of surpassing a 2°C global warming threshold is becoming increasingly real, it is also ever more urgent to think in imaginative ways about possible systemic options to **increase the capacity of agents to transform their own contexts of action and to improve the resilience of social-ecological systems to potential high-end climatic changes.**
- The 5-year EU project IMPRESSIONS (Impacts and Risks from High-End Scenarios: Strategies for Innovative Solutions) focuses on transformative science and **integrative solutions dealing with uncertainties and strong non-linearities using a range of scenarios of higher-end climate change**, but also including intermediate below 2°C warming levels.

What is climate transformative science?

- In the context of climate change, **transformation refers to a change in the fundamental attributes of natural and human systems** and reflects strengthened, altered, or aligned paradigms, goals, or values towards promoting adaptation that supports sustainable development, including poverty reduction (IPCC, 2014)
- Transformability can be understood as the capacity of agents to create a fundamentally new system** when ecological, economic, or social structures and processes make the existing system untenable (Walker et al. 2004, Westley et al. 2013).
- In transformative science**, emphasis needs to be placed on mapping and understanding heterogeneous **agency, social-ecological interactions and integrated governance options** and the implications, e.g. in terms of distributional effects and agent transformational and adaptive capabilities, of sudden fundamental system changes (Tàbara 2011).
- Key questions: 1. **'Who and what needs to change?'** 2. **'What systems of interconnected solutions can best support the development of transformation policies and pathways towards sustainability?'** (Figures 1 & 2). A major difficulty is that as global warming moves beyond the 2°C threshold, social-ecological systems oscillations and variability may increase, thus increasing the difficulties of present modelling tools and methods to adequately represent potential non-linear behaviours and tipping points –and support robust policies and actions for HES.

Figure 1. A framework for analysis of transformative methods

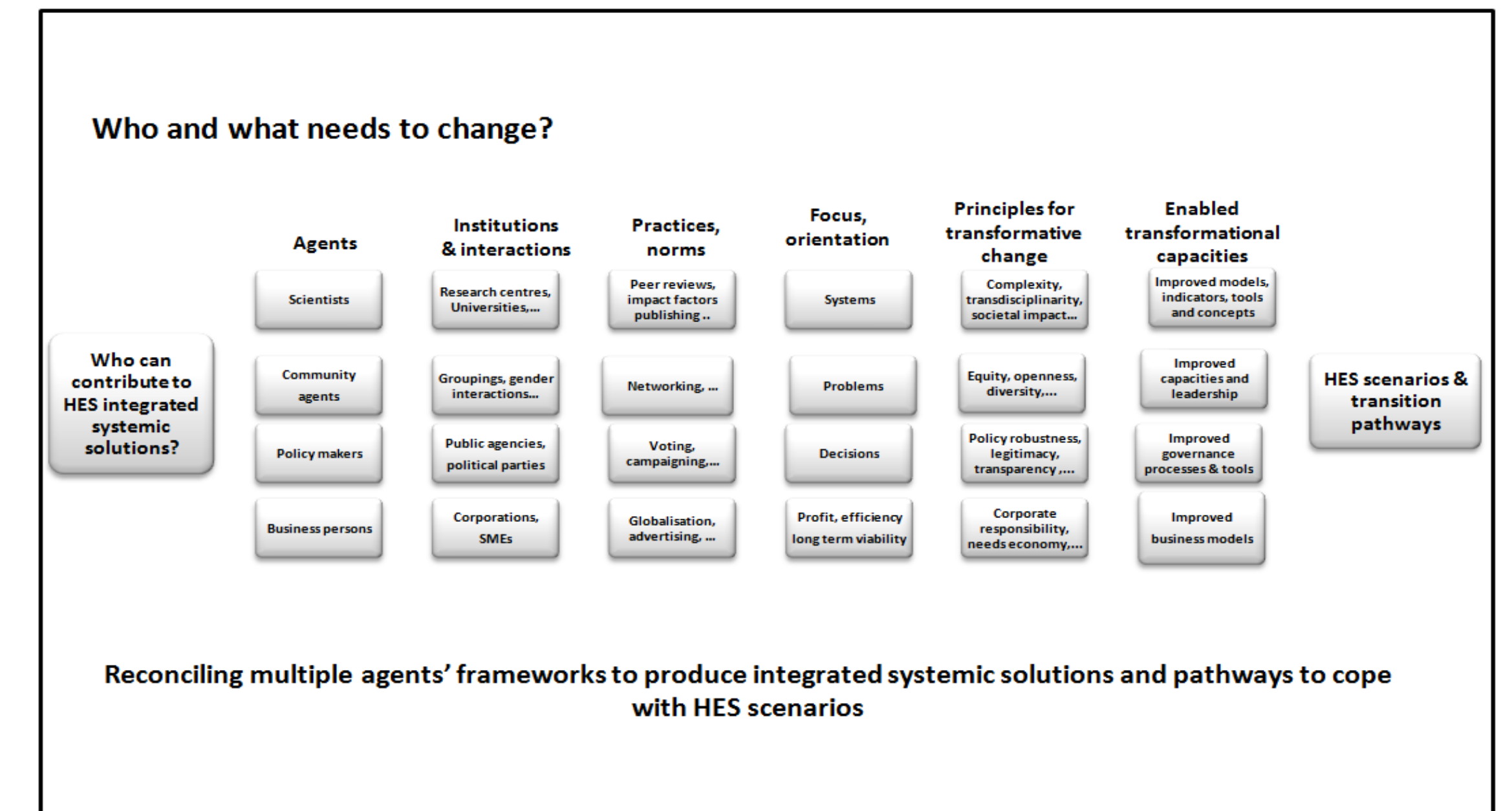
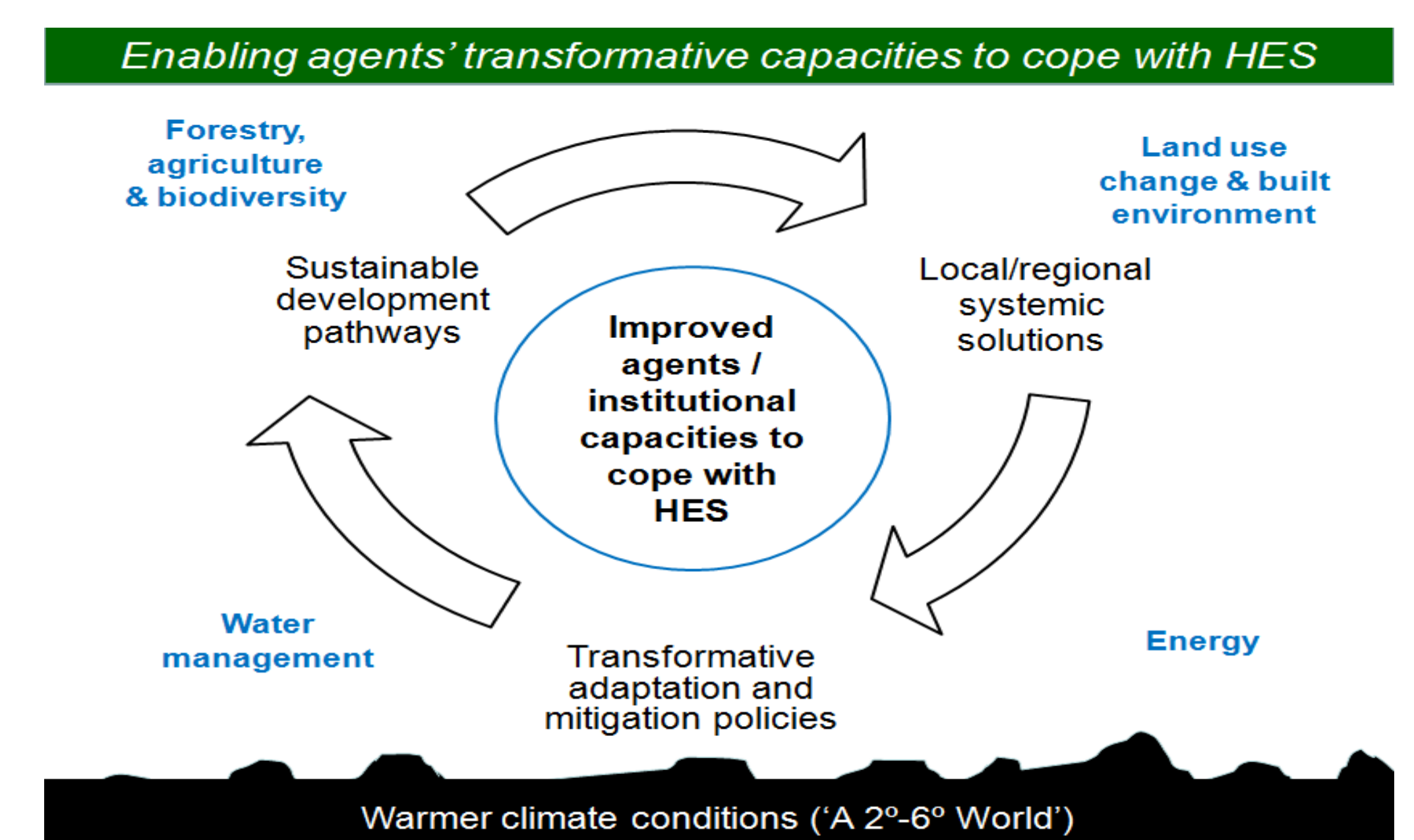


Figure 2. Linking systemic solutions to sustainable transformative pathways in the Iberian Peninsula



The Tagus and Guadiana River Basins: a comparative integrated solutions-based approach

- The Iberian Peninsula river basins are among the European basins most likely to be affected by climate change, and especially in the case of high-end scenarios (HES). This study focuses on the conditions, structures and processes that enable relevant agents - including policy makers, trans-boundary institutions and local organisations- to develop and implement integrated solutions, and to build transformative capacities aligned with sustainable pathways to cope with HES in the Tagus and Guadiana river basins (Figures 4 & 5).
- This approach starts from the **analysis of already-proposed or tested integrated solutions and then, explores the new requirements for resilience in the context of HES.** This is done by:
 - Evaluating the state of implementation of the European Water Framework Directive and how to improve the River Basin resilience and policy robustness of in the context of HES.
 - Analysing the new challenges constraints and opportunities posed by mainstreaming extreme climate change into Integrated River Basin Management (IRBM), and testing a series of alternative solutions for river and landscape management at the basin level.
 - Looking at a series of nested examples of integrated solutions at the local level, mainly Ecosystem-Based Adaptation (EBA) which will also take into account other integrated and innovative options and practices dealing with adaptation, mitigation and sustainable development (e.g. at farm level).
- The overall goal is to explore the conditions, options and leverage points for **enhancing overall system and agents' resilience and extreme transformability in situations of HES.**

'Extreme transformability': beyond adaptive capacities

- Extreme transformability* can be understood as those anticipatory and proactive capabilities (including leadership, systemic planning and extreme coordination abilities) of agents to transform the fundamental attributes of the social-ecological systems in which they operate to a desirable future.
- In our context, the concept of *extreme transformability* goes beyond the notion of adaptive capacities insofar as it entails the **capacities to organise and coordinate systems of interlinked solutions** which contribute to adaptation, mitigation and sustainable development pathways **even in situations of extreme / high-end climate scenarios.**

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Figure 4. Tagus River Basin



Figure 5. The Guadiana River Basin



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