

## Research agenda briefing

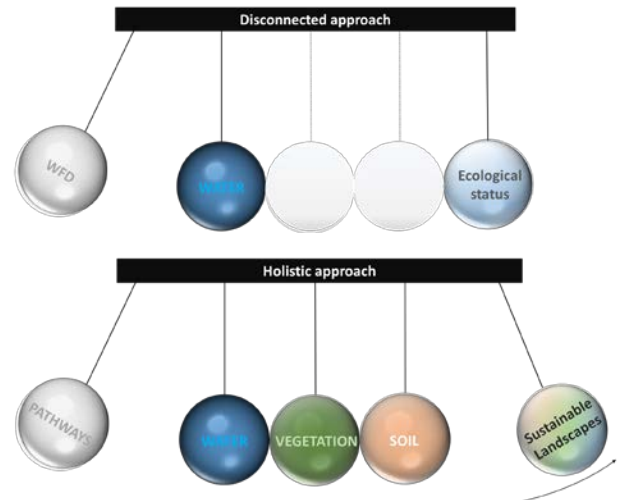
# Pathways to holistic landscape management

### Executive summary

Landscapes require a paradigm shift towards managing them in a much more holistic way in terms of integrated monitoring, emergence and interconnected stakeholder interfaces for multi-level management systems. To achieve sustainable development goals, this briefing sets new cross-disciplinary objectives for the EU research agenda 2021-2028.

### Introduction

Partial visions on environmental management in the past did not bring about the desired outcome of sustainable landscapes (Fig. 1); poor environmental conditions such as the current status of fresh-water resources (Fig. 2) or substantial economic losses from agricultural landscapes (Fig. 3) persist across Europe. The key reason of current shortfalls is the *disconnected* handling of the environment in research and management (top of Fig. 1 schematises the Water Framework Directive as an example). A way forward is a more *holistic* approach (bottom of Fig. 1): multiple agencies need to operate simultaneously to affect landscape management, both biophysical and socio-economical, at a variety of spatial and temporal scales. What is required is the integration of available information and an investigation of landscapes in a more holistic manner, focusing on connections among these multiple agencies in order to achieve effective, adaptive and resilient land management.



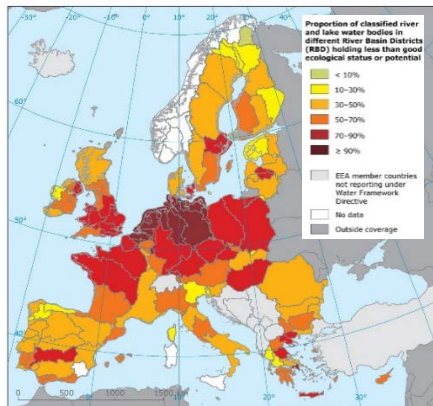
**Figure 1: Disconnected versus holistic landscape management (WFD: Water Framework Directive)**

### Background

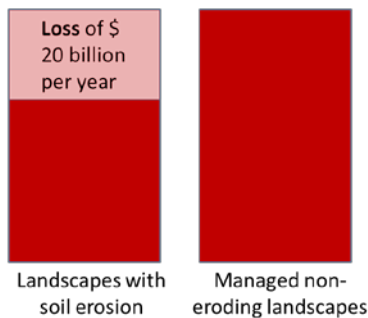
We are the group 'Connectivity and Society' of the EU-COST Action ES1306 Connecteur: Connecting European Connectivity Research, who is working since 2014 on diverse aspects of water and land management. Combining our experience and expertise across Europe in the emerging field of connectivity, the Connecteur COST Action enabled the transitions:

- from parallel projects within single disciplines to concerted research within an interdisciplinary framework with strong linkages to practitioners involved in the management of water and soils in landscapes;
- from a plethora of case studies to more generic, comparable research;
- from a multiplicity of definitions, concepts and methodological approaches to coordinated, theory-guided research activity along agreed lines.

From this background, we want to make a step-change beyond the framework of water and sediment connectivity to consider all aspects of connected, complex landscapes, such as vegetation and land management, as a framework for the next EU research Agenda.



**Figure 2: Proportion of classified river and lake water bodies in different River Basin Districts (RBD) holding less than good ecological status or potential. Source: WISE WFD Database**



**Figure 3: Income of agricultural landscapes: amount of soil lost to water erosion in Europe equates to an estimated loss of about US\$ 20 billion per year, based on a replacement cost of \$20 per tonne (Panagos et al. 2015, Nature 526:195)**

### The proposed research objectives are:

- 1) To develop integrated monitoring of pathways of matter and energy across landscapes. Such monitoring will encompass soil, water, nutrients, human population, biodiversity, goods and services. To achieve this objective new technologies and advanced data management will be required, including developing equipment and methodologies for multiscale monitoring networks.
- 2) To understand the roles of resilience, sensitivity, tipping points and emergence for holistic landscape management. This objective requires the development of new multidisciplinary modelling approaches to integrate matter and energy

fluxes *sensu lato* at a range of temporal and spatial scales.

- 3) To develop interconnected stakeholder interfaces for multi-level management systems. Such systems will exploit new technologies (e.g. web platforms, apps) for accessing stakeholder knowledge to give added value to the outcomes of objective 1 and 2. This will lead to holistic, smart management strategies and facilitate their implementation.

### Anticipated results

By taking a holistic perspective, science and stakeholders can provide a new approach to sustainable landscape management. This perspective avoids past mistakes resulting from restricted management viewpoints and provides support to achieve established EU goals for an enhanced resilient economy, environment and wellbeing.

Using a holistic approach will allow us to impact on many current environmental issues, including the identification of flashpoints of diffuse pollution within managed land; establishment of early-warning systems for conflicting demand on land resources, improved buffer functions against natural hazards and enabling compliance test for pollution control including a number of new pollutants such as microplastics and emerging pollutants.

### Recommendation

For the next framework programme FP9 and upcoming national research calls, we recommend that the EU Commission includes a call for research on **Pathways to holistic landscape management** in order to address the three objectives as stated above.

### For more information, please contact:

EU-COST Action ES1306 Connecteur  
Webpage: <http://connecteur.info/>  
WG Society: [Eva.Paton@tu-berlin.de](mailto:Eva.Paton@tu-berlin.de)  
General info: [Contact@Connecteur.info](mailto:Contact@Connecteur.info)