



Securing the Conservation of biodiversity across Administrative Levels and spatial, temporal, and Ecological Scales

SCALES (2009–2014) is a European research project financed by the seventh EU framework programme for research and development (FP7). SCALES seeks ways to better integrate the issue of scale into policy and decision-making and biodiversity management in the EU.

For more information please see: www.scales-project.net

Issues Brief for the SCALES stakeholder workshop

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By WP1 Understanding combinations of anthropogenic and natural processes across scales and
WP4 Multi-level governance and policy instruments*

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Safeguarding biodiversity is all about scales

Biodiversity and ecosystem processes & services occur in many scales. The ecological characteristics of species vary greatly in scale – the home range of Iberian lynx, a critically endangered species endemic to the Iberian Peninsula, is hundred times larger than the habitat of Cabrera's vole, equally endemic to the area. Also the generation time and reproduction rate of these two species differs greatly. Similarly, different ecological processes and ecosystem functions take place at different temporal and spatial scales. For example, the maintenance of soil fertility supporting plant life is a local process whereas the circulation of water that helps to maintain wetland habitats (e.g. their structure, functions and related ecosystems services) takes place at

a much larger scale. These scale-related characteristics of species and ecosystems create different requirements for their conservation and sustainable management. Attention to scales helps us to understand our natural world and its processes. It improves our ability to govern biodiversity and the pressures threatening it.

Scale has relevance also for human activity. The main pressures on Europe's biodiversity and ecosystems (habitat loss and fragmentation, disturbance, and climate change) and the socio-economic drivers behind these pressures are also scale-dependent (Box 1). Therefore, effective policy interventions to conserve biodiversity, ecosystems and their services within the EU need to be sensitive to different scales.



B Box 1. Up, down & across scales – drivers behind biodiversity loss vary across scales

Biodiversity loss and ecosystem changes are the outcomes of multiple drivers that often operate simultaneously and at various scales. Drivers of change do not work in isolation but they often interact. The way these different drives appear changes as we move across scales.

Changes in evenness. Some drivers of change may appear more evenly distributed across EU when they are observed at regional and/or local level, but they may show strong spatial clustering at national level. For example, wetland loss shows a strong spatial clustering at national level (NUTS-0), predominately concentrated at central and eastern countries but appears much more widespread when it is observed at lower administrative levels (NUTS-3) (Fig.1)

Changes in intensity. The intensity of a driver may appear relatively low at national level but when analysed at regional-local level, it may show a strong concentration with only few areas of very low intensity and a large number of areas with high intensity. For example, urbanisation appears low in the UK at national level (NUTS-0) but when the analysis is repeated at local level, a strong difference appears between the heavily urbanized south and the less urbanized north. (Fig.2)

The spatial differentiation and aggregation that some drivers of changes show as we move across administrative levels is evidence that drivers are sensitive to scales. This scale sensitivity varies considerably among drivers. Most of the drivers that directly affect biodiversity and ecosystems (direct drivers) show high scale sensitivity with characteristic examples being deforestation, agricultural conversion and wetland loss. The presence of scale sensitivity has important implications for policy making. For example, policies addressing direct drivers of change (such as land conversion) need to be sensitive to scales (i.e. to take scale into consideration during the designing process) in order to better respond to scale differentiation that is observed across administrative levels.

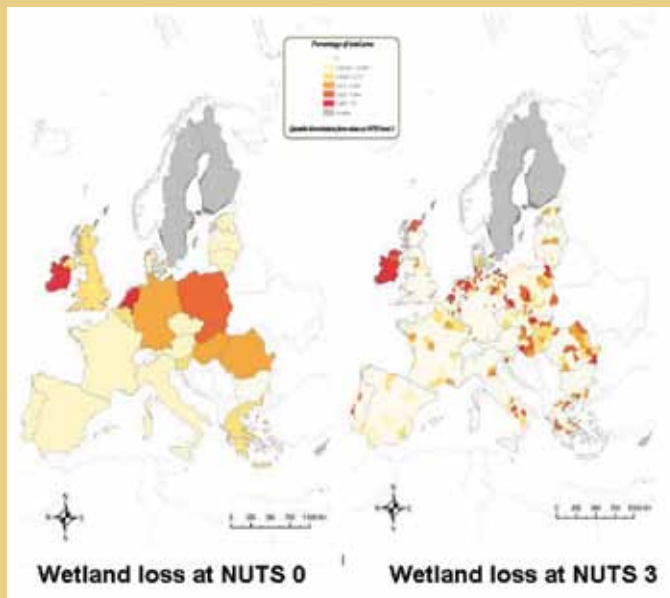


Fig. 1. Changes in evenness of drivers: loss of wetlands across the EU.

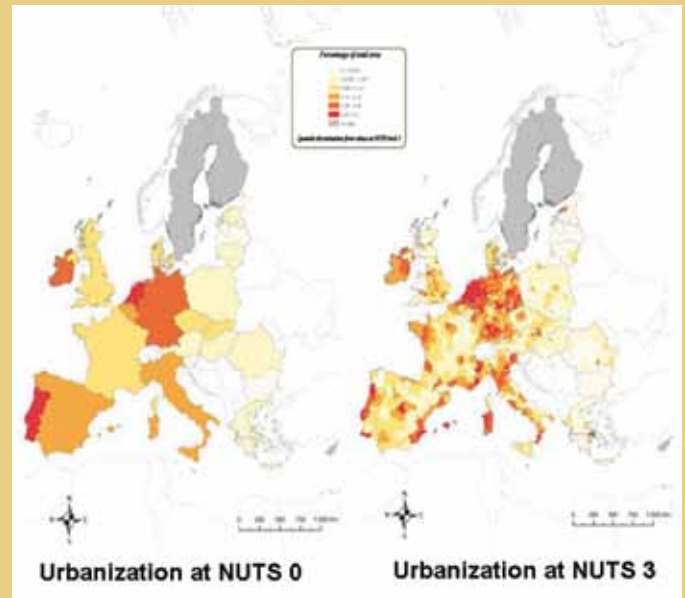


Fig. 2. Changes in intensity of drivers: urbanisation across the EU.

NUTS (Nomenclature of Territorial Units for Statistics) refers to the regional classification within the EU. NUTS 1: major socio-economic regions; NUTS 2: basic regions for the application of regional policies; and NUTS 3: as small regions for specific diagnoses.

Governance and ecologically relevant scales do not always match. Policies and decisions that shape human activities (e.g. act as possible drivers for biodiversity loss) and affect the status of biodiversity and ecosystems in the EU take place at many administrative levels, involve many governmental and non-governmental actors, and employ a range of instruments at different scales. Therefore, matching policies with relevant conservation problems is challenging.

Policies for conserving biodiversity and ecosystems tend to be focused on “ecological units”, i.e. protecting particular species or habitats in certain, rather distinct areas (e.g. biogeographic regions). These policies might face challenges in addressing relevant **spatial scales** and requirements for conservation, e.g. fail to maintain the connectivity of habitats utilised by species or successfully protect the entire ecologi-

cal system underpinning the provisioning of ecosystem services. For example, policies might not be adequately coordinated across geographical regions or administrative boundaries, resulting in ineffective implementation of conservation measures and failures reaching the set objectives.

Furthermore, the conservation of biodiversity and ecosystems needs to recognise issues related to **temporal scales**. Ecological processes (e.g. species life- & reproduction cycles, nutrient cycles and decomposition processes) vary in time. The governance systems also have time-related characteristics of their own, e.g. fixed electoral cycles, tendency to respond to immediate economic interests, varying timescales of decision-making processes and a rather slow change in norms and behaviour.



Our failures to conserve biodiversity are often caused by the fact that the governance levels and timescales for decision-making differ from the ecologically significant units and timescales, creating a mismatch between the natural world and our efforts to protect it. For example, the borders of nation states, municipalities and private properties rarely coincide with ecological units. Also, the status of biodiversity, ecosystems and their services often changes so slowly that the management and governance systems have difficulties in recognising – not to mention acting on – this change. Furthermore, the costs of conservation are often born at the local level, whereas benefits of biodiversity conservation reach far beyond municipal or private-property boundaries. For these reasons, protecting biodiversity, ecosystems and their services requires attention to the scale (both spatial and temporal) and making the right decisions about what “ecological units” to address. Even more broadly, operationalisation of very general targets, such as halting biodiversity decline, also requires attention to scale, i.e. the relevant units at which conservation is targeted and at which governance takes place.



Spatial and temporal scales as well as ecological and governance units are in constant interaction with one another. When these interactions are harmful for biodiversity, they can be considered **mismatches**. Examples of scale-mismatches include, for example:

- Mismatch between ecology and governance: administrative boundaries may hinder maintaining / restoring ecological connectivity between protected habitats.
- Mismatch between governance levels: setting targets at a central level might not allow conservation initiatives and priorities to be set at the local level. Also, policies at different jurisdictional levels might be based on different assumptions: motivation, compliance, control, sanctions and management, costs and benefits, information exchange and decisions differ between municipality, regional, national or EU-levels.
- Mismatch between timescales: short term solutions are used for solving enduring problems, and can result in new long-term problems.
- Mismatch between policy sectors: biodiversity governance has little impact on other policies influencing economic activity, e.g. CAP. Also, governance of economic activity (e.g. agriculture, natural resource extraction) might change that economic activity to be harmful to biodiversity in new ways or at different scales (e.g. homogenization of habitats, shift in use of raw materials).



Interactions and mismatches between different scales and levels. One way to think of scale is with attention to the dimension (e.g. spatial, temporal, quantitative or analytical) that is used to measure and understand a phenomenon (e.g. biodiversity or socio-economic activity). On these scales the units of analysis (or targets of policy) can be called levels (Fig. 3 below)

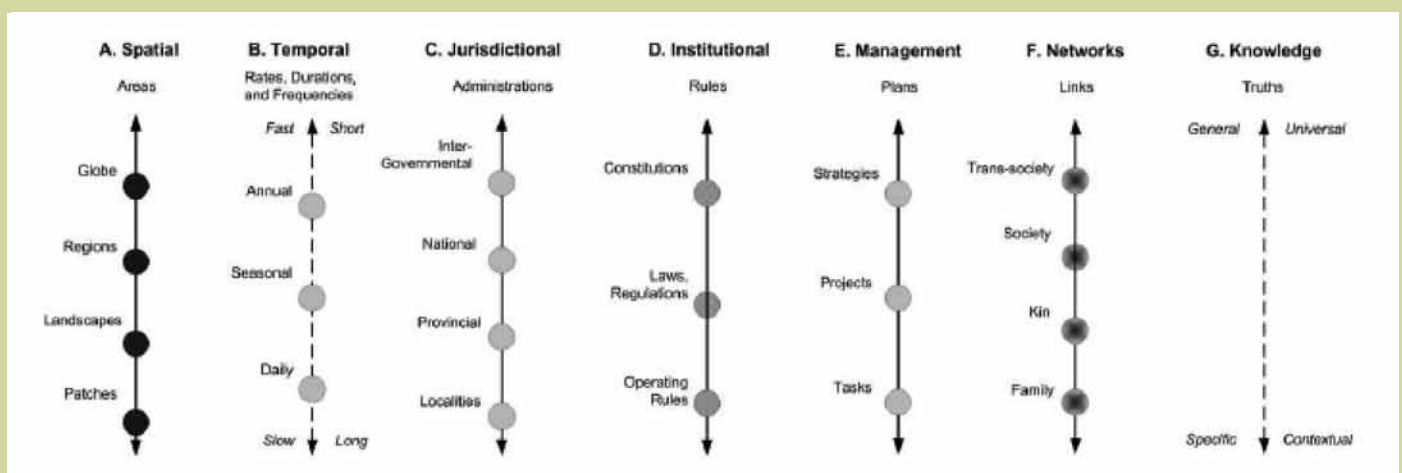


Fig. 3. Different types of scales and levels critical for understanding and governing human-environment interactions (Source Cash, D. W., W. Adger, F. Berkes, P. Garden, L. Lebel, P. Olsson, L. Pritchard, and O. Young. 2006. Scale and cross-scale dynamics: governance and information in a multilevel world. *Ecology and Society* 11(2): 8.



- Mismatch between the costs & benefits of conservation: the loss of biodiversity and the degradation of ecosystems and their services are often caused by national & global drivers, however their negative impacts tend to affect most severely stakeholders at local level. Similarly, the costs of conservation tend to occur at the local level, whereas benefits of biodiversity conservation are often more regional, national or global.

Consequently, successful conservation of biodiversity needs policies, decision-making mechanisms and instruments that are able to recognise and address different scales and relevant interactions between them. Such scale-sensitive biodiversity governance aims to avoid serious mismatches between ecological and governance scales.

Crossing scales for biodiversity The EU biodiversity policy beyond 2010

The ongoing year marks the deadline for EU's goal to halt the loss of biodiversity by 2010. Despite the efforts to date, the EU will not achieve its target and therefore increased efforts are needed to step-up the conservation of biodiversity and ecosystems beyond 2010¹.

The continued loss of biodiversity and degradation of ecosystems also indicate that the existing EU policies for biodiversity have not succeeded in effectively addressing the complexity of scales as outlined above. In addition to the management of individual sites, successful long-term management of the EU's Natura 2000 Network also requires actions at broader land- and seascape scales to enhance the ecological connectivity between protected areas. For example, ensuring the movement of species between sites is crucial for the adaptation of biodiversity to climate change. Given that most of the EU biodiversity and ecosystems (e.g. important ecosystem services) lie outside protected areas, it is increasingly important to ensure the protection of biodiversity and ecosystems also at the scale of the wider environment.

Scale-related issues can be foreseen as one of the key challenges for the EU biodiversity policy beyond 2010. These aspects are crucial, for example, to improve the ecological coherence of the Natura 2000 Network and to safeguard the integrity and functioning of ecosystems across wider landscapes (e.g. the supply of ecosystem services).



Key questions to be explored in the workshop

1. Are existing policies (EU & national) effective in addressing scale-related issues?
 - a. Which policies target **evenly and wide spread** pressures on biodiversity – how are they effective and where do they fall short?
 - b. Which policies target **intensive and concentrated** pressures on biodiversity - how are they effective and where do they fall short?
2. How can we develop new policy solutions that are more effective in addressing scales?
 - a. Learning from successes: what biodiversity conservation challenges we managed to tackle successfully?
 - b. How have coordination and cooperation across administrative levels and between different actors contributed to the solution?
 - c. How does biodiversity conservation planning tackle the human drivers of biodiversity loss?
 - d. What biodiversity conservation issues remain unresolved?
 - e. How do coordination and cooperation across administrative levels and between different actors influence these issues?
 - f. How could coordination and cooperation be used in solving these issues?
 - g. What role can different policy instruments – for example regulation, economic instruments and communication – play in coordination and cooperation?

¹ COM/2008/864, COM/2009/358, COM/2010/004