ECOLOGICAL CONNECTIVITY IS ESSENTIAL FOR BIODIVERSITY AND ADDRESSING CLIMATE CHANGE

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It is all too easy to focus on the achievement of the 30 x 30 Biodiversity target agreed by the CBD CoP in the Kunming-Montreal Global Biodiversity Framework[i]. However, it is only one of the 23 targets all implemented through the long standing Ecosystem Approach of the CBD. Target 1 homes in on spatial planning and effective management processes. Target 2 frames the 30 x 30 target as enhancing biodiversity and ecosystem functions and services, ecological integrity and connectivity. Target 3 sets the context for the 30 x 30 by emphasising "*well connected…and integrated into wider landscapes, seascapes and the ocean*". These targets are set within one of 4 goals of the Framework: "*the integrity, connectivity and resilience of all ecosystems are maintained, enhanced or restored substantially increasing the area of natural ecosystems by 2050*".

What do we mean by connectivity? The *IUCN Guidelines for conserving connectivity through ecological networks and corridors*[ii] state that "*Connectivity conservation is essential for managing healthy ecosystems, conserving biodiversity and adapting to climate change across all biomes and spatial scales. Well-connected ecosystems support a diversity of ecological functions such as migration, hydrology, nutrient cycling, pollination, seed dispersal, food security, climate resilience and disease resistance*". This clearly challenges traditional approaches and encourages the use of whole natural systems and whole landscape and seascape approaches. The Guidelines emphasise the scientific underpinning of this approach "*science overwhelmingly shows that interconnected protected areas and other areas of biological conservation are much more effective than disconnected areas in human-dominated systems, especially in the face of climate change*".

More specifically IUCN defines ecological connectivity as *"the unimpeded movement of species and the flow of natural processes that sustain life on Earth*". Specifically, it means building in functional connectivity for species, i.e. how well can they move through land- and water-scapes; and structural connectivity, i.e. making sure that physical elements in land and water habitats have permeability. Additionally, ecological corridors should be designed into the system.

Taking this forward into practice, we can learn from what is happening elsewhere. The EU Nature Restoration Regulation encourages acting at the ecosystem scale with Member States producing Nature Restoration Pans by late 2027. In the Alps, for example, ecological connectivity restoration areas are being identified and actioned through national plans. A joint Portuguese and Italian team have drafted *Guidelines for connectivity conservation and planning in Europe,* containing many valuable ideas and detailed guidance[iii].

Why do we need connectivity in our British land and seas? Quite simply because our protected areas are too fragmented by development and by land uses not supporting ecological processes. And many of them are too small except in the upland areas.

What does it mean in practice in Britain? Planning and acting at macro scale within whole landscapes and seascape is essential. It means ensuring that existing protected areas are networked and connected spatially and ecologically. It means moving from the static approach to protecting nature to embracing and predicting the dynamics driven by climate change and making space for species and habitat movements. More specifically, on rivers it means removing the Industrial Age weirs and

dams that are no longer necessary to allow fish to migrate and nutrients to flow downstream. On arable farmland it means reconnection by reinstating conservation headlands and hedgerows and reducing the size of fields across farm ownership boundaries. In transport networks it means constructing physical links within infrastructure using tunnels and bridges. In woodlands and forests it means ensuring that, alongside the varied mix of native species, there are structural connections to allow birds to nest and shelter and raptors to scavenge for prey. In urban areas it means a new spatial planning ethic linking parks, gardens, tree-lined streets and water courses. In upland areas it means connecting the large EU derived protected areas through ecological corridors. Along soft coasts it means building in natural features rather than the reliance on hard engineering structures or engineered golf courses so that dunes, slacks and other natural features provide connections.

There are so many opportunities for ecologists and environmental managers to make the case and apply good practice to transform our approach to restoring nature.

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[i] CBD. 2022. https://www.cbd.int/gbf
[ii] IUCN 2020. https://doi.org/10.2305/IUCN.CH.2020.PAG.30.en
[iii] Moreira et al 2024. https://doi.org/10.3897/arphapreprints.e129021