DRESDEN NEXUS CONFERENCE

DNC 2022 | BIODIVERSITY Stewardship for vital resources

Recognizing the complex and interwoven role of biodiversity in the Resource Nexus: Signatory Document of the Dresden Nexus Conference 2022

Introduction

Past and present environment and resource management approaches have been inappropriate and short-sighted and have resulted in multiple predictable and unpredictable emergent issues and problems. We now face a biodiversity crisis, a changing climate, food and energy insecurity, rapid urbanization in certain areas, an increased rate of emerging zoonosis with the potential for pandemics, shifting demographics, and development disparities, with social justice consequences.

The Resource Nexus concept offers an opportunity to daylight and address these challenges and develop sustainable solutions. This approach takes us beyond looking at individual resources or components and demands holistic consideration of complex systems' functioning, productivity, and management (Hülsmann and Ardakanian, 2018).

The Resource Nexus concept presents an opportunity for transformative change by addressing the emergent complex, interrelated resource crises. This emerging and rapidly evolving approach is particularly useful in that it forces us to think about the linkages between social-ecological system components. Social-ecological systems are recognized as complex systems, and the Resource Nexus concept aids in engaging this multifaceted and challenging space. However, the way in which biodiversity has been engaged within the Resource Nexus concept has so far been inadequate. This is backed up by the increasing calls for research on ecosystems and their links to the water energy food nexus, put out by large international funding agencies (Horizon Europe, PRIMA calls: Mediterranean region).

This knowledge gap forms the focus of the 2022 Dresden Nexus Conference (DNC 2022). This meeting provided the opportunity to explore the role of biodiversity in the Resource Nexus. Biodiversity is defined holistically as the diversity of species**,** genetic variation among species, their complex assemblages in ecosystems, their interactions and functions in the environment (Noss 1990), and the differences among habitats.

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Problem statement

Mismanagement, poor planning and inappropriate policy related to our natural resources and landscapes, in both developed and developing country contexts, have resulted in multiple linked planetary pressures. Of the approximately eight million animal and plant species known to science worldwide, around one million are threatened with extinction. This loss of biodiversity is one of the greatest threats to planetary function and our long-term survival (IPBES 2019). The state of biodiversity directly impacts us, both individually and collectively (Leibniz Research Network Biodiversity et al. 2022), and these impacts are linked to a range of nexus issues. Therefore, the effective operationalization of the Resource Nexus concept requires that we more clearly engage with the underpinning role biodiversity plays in supporting human activity. So far, this role has been largely overlooked. The DNC 2022 has specifically focused on the role of biodiversity in the Resource Nexus. Emergent thinking is captured here.

Clarifying the role of biodiversity within the Resource Nexus

The term “Nexus” in Latin describes the act of tying together or something which binds. In connection with environmental resources management, the term nexus was introduced during the 1980s by the United Nations Universities Food-Energy Nexus programme (Sachs and Silk 1990). However, the Nexus Approach only gained prominence in international academia and policy circles in the lead-up to the Bonn2011 conference on the “Water, Energy and Food Security Nexus”. The conference argued that such an approach could improve water, energy, and food security by integrating “management and governance across sectors and scales”, reducing trade-offs, building synergies, promoting sustainability, and transitioning to a green economy (Hoff 2011). The Resource Nexus has been expanded to include land and materials, and environmental functions have been partially included within the land domain (Harper 2007).

It is here acknowledged that all critical environmental resources, are at their foundation, comprised of either landscape and/or seascape elements (including, for example, terrestrial, marine, coastal and freshwater features). We also recognize that oceans must be more clearly included in Resource Nexus thinking as a critical environmental resource. Furthermore, freshwater biodiversity elements, critical for water quality and quantity regulation, also need to be integrated into the resource nexus and the concepts of critical environmental resources. Biodiversity and its components, genes, species and ecosystems, in concert with abiotic processes, provide the building blocks of the structure and function

of ecosystems and landscapes. These underpin all aspects of the Resource Nexus (figure 1). Biodiversity provides valued regulatory functions such as contributing to critical climate regulation, soil retention for land use, material and instrumental contributions such as local natural and biodegradable fibre for materials. It also provides non-material contributions and relational functions where people are afforded the opportunity to have a sense of belonging and community expressed through biodiversity-rich characters of a landscapes or seascape, their material connection to local species, and ultimately intrinsic values where nature is valued simply for its existence and because of its magnificent appearance. These lenses demonstrate how biodiversity operates within and contributes to the Resource Nexus linking across critical environmental resources.

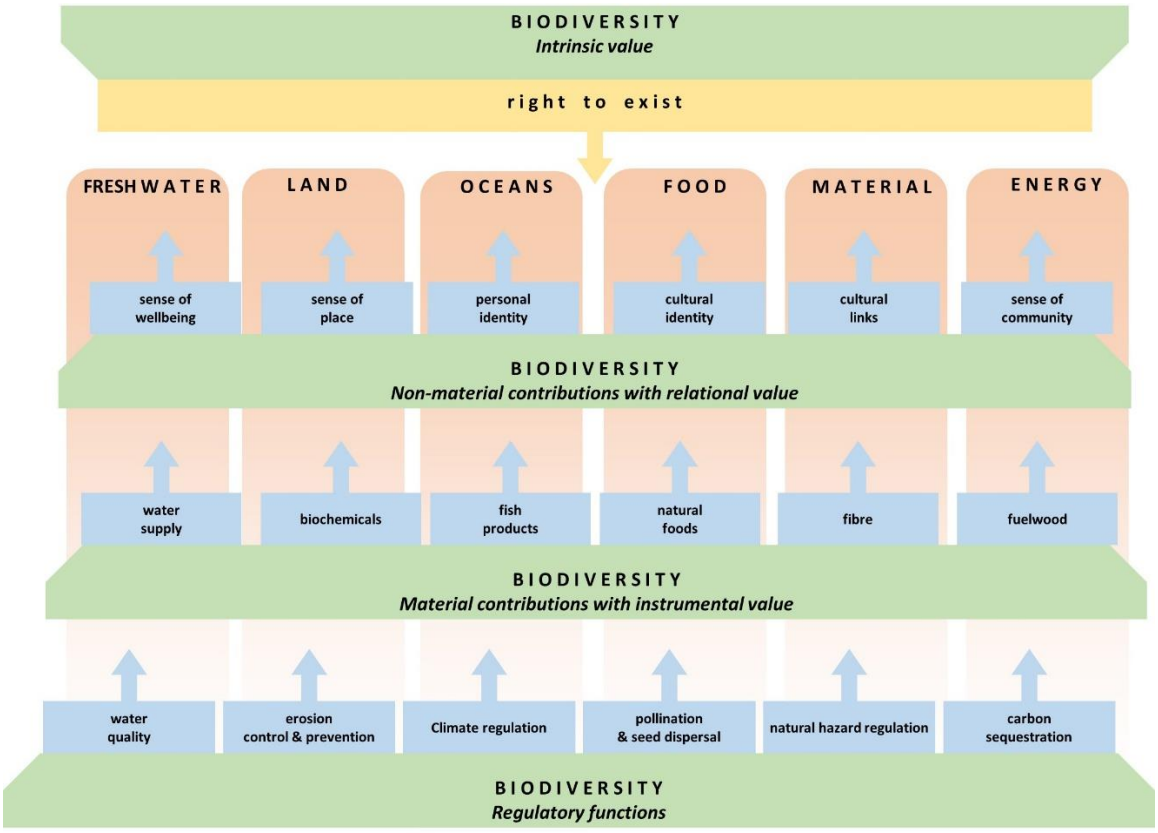

Figure 1. The four lenses - regulatory functions, material contributions with instrumental values, non-material contributions with relational value, and intrinsic values, through which biodiversity support within the resource nexus is evident.

Acknowledging that biodiversity plays an underpinning role in the Resource Nexus, regulating and resourcing, it becomes imperative to revisit the representation of the nexus (figure 2). Previous representations have placed all domains / critical resources on a single level or at the same level. Emerging understandings suggest that a hierarchical approach that positions biodiversity as enmeshed among the land, ocean and freshwater elements sits as an underpinning feature to the identified domains such as energy, food and materials. This more integrated and layered conceptualization allows for a better understanding of the tensions and drivers within the Resource Nexus and can enhance management (Bleischwitz et al. 2018). Taking this thinking to the national and global scales may allow for more effective engagements toward achieving the SDGs, but should be linked to international sustainability and accounting standards (such as the EU CSRD and ISSB). According to this layered approach, these could be reorganized to better demonstrate linkages and enhance their collective achievement. When viewed from this hierarchical perspective, awareness of the trade-offs or synergies becomes clear.

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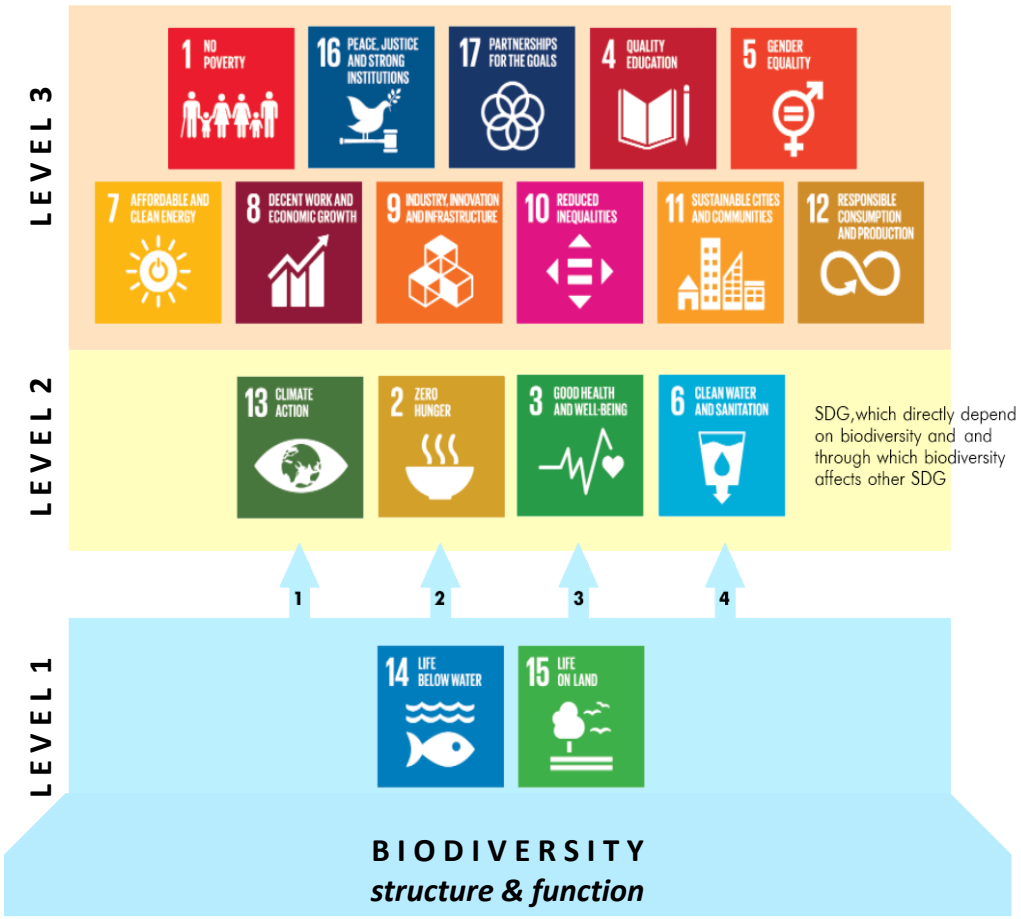

Figure 2. A hierarchical basis for approaching the Resource Nexus interactions given the foundational aspects of biodiversity. Biodiversity aspects need to be considered as primary in unpacking Resource Nexus linkages, and each subsequent level provides and important social-ecological structure for the next subsequent level. Biodiversity directly affects (Level 2) the Climate (Goal 13), Food Security (Goal 2), Human Health (Goal 3) and water security (Goal 6) ((as shown by arrows – 1. climate-regulating ecosystem services, 2. provisioning ES (fish catch, fodder for cattle from natural pastures, edible wild plants and fungi, game production), 3. ecosystem regulation of natural focal diseases, 4. water-regulating ES (regulating of runoff quality and quantity by terrestrial ecosystems, water purification in aquatic ecosystems). Societal feedback on transitional goals (Level 3) and biodiversity is also important, as well as interconnections between goals (not shown in the figure for simplicity).

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Building future Resource Nexus research directions – emergent conference messages

Contributions and emerging work from the Dresden Nexus Conference 2022 highlight three clear directives, focused on research needs, developing novel approaches and partnerships for advancing our understanding of the role of biodiversity within the Resource Nexus.

1) Research needs

While much understanding has already been achieved, we still have considerable work to do in reimagining the role of biodiversity within the Resource Nexus. Whilst elements of this are highlighted above, the role of biodiversity as an underpinning for all environmental resource-related activities requires considerable further attention and integration. This conference has highlighted the need for broadening the scope of the Resource Nexus, for example, with the inclusion of current work on oceans and ocean biodiversity (blue economy).

This in turn reminds us of the importance of scale and that further research is required across and between all the biodiversity hierarchical scales from local to global (IPBES 2019). Being cognisant of spatial and temporal scales will be critical in aligning conservation with sustainable resource use.

Taking resource nexus thinking into all realms of resource use and conservation will likely highlight critical trade-offs, giving more accurate depictions of the costs and benefits, who the winners and losers are under different scenarios, and where conflicts will arise. Past understandings, that have emerged from more siloed approaches may need to be re-examined. These insights will allow for more just and equitable management and decision making taking into account related needs and obstacles of those implementing biodiversity.

Presented research suggests that governments have tended to adopt a lowest cost and short-term approach to resource management (IPBES 2019). The full implications of management and regulations, for example, on ecosystem structure and composition, need to be better understood. Particular attention will need to be paid to human wellbeing, social equality, equity, and gender issues in resource access and distribution in all future research.

2) Novel approaches and actions

A key emerging conference theme was that in working toward sustainable development and meeting Agenda 21 commitments, we need to develop and adopt novel approaches and immediate action, in reporting and assessment (such as Cumulative Effect Assessment), management, advancing our understanding through research, and tackling issues. Novel frameworks are emerging that provide decision-makers with the tools to better understand and manage nexus issues, particularly within the food water energy nexus. Truly forward-looking frameworks have transformative change at their core and adopt a self-reflective approach through iterative engagement that reflects on learning. There is also growing recognition of the value in adopting a plurality of approaches in generating understanding, for example integrating economic, social, health and ecological methods and co-developing this research with a diversity of stakeholders.

Advances in technology also present new opportunities for both research and industry. New technologies, production strategies and ways of creating sufficiency are being developed to reduce the use of raw material, reduce industry impact on ecosystems and/or avoid and manage waste. Improved technology in statistics, remote sensing and computer processing capacity continues to allow us to work at finer resolutions and build more complex models for building nexus understanding.

Nature based approaches, such as the blue economy, green infrastructure, biodiversity offsets and the associated instrumental value of biodiversity, position nature at the centre of development. Nature based solutions and green infrastructure are an emerging paradigm for development becomes more prominent as we further understand the climate change, urbanization, biodiversity nexus and the need to mitigate both risk and impacts of change. Furthermore the Urban agriculture which can assist in mitigating biodiversity loss through local small scale production also offers important emerging opportunities. These approaches also allow for insights into relational values, showing the links between human wellbeing, physical and mental health, and biodiversity, particularly in urban settings.

3) New partnerships

Novel partnerships are instrumental in resolving tensions and trade-offs across the Resource Nexus. Successful partnerships must emerge based on trust, most likely achieved through extensive dialogue, identified commonalities, and emerging data and information.

These partnerships are required between scientists and policymakers, strengthening the science-policy interface and across the associated disciplines. Here, transdisciplinary approaches are vital for understanding the role of biodiversity in the resource nexus, providing data and scientific evidence needed to enhance the development of theory, strong targets with clear actions, and pragmatic management approaches. Bottom-up approaches, inclusive of or led by stakeholders, also appear to drive the alignment of legislation and regulation of resource management.

The development of carefully considered locally developed guidelines and best practice guides also have much to offer in promoting unbiased decision-making. These tools and approaches are valuable in content and development, where stakeholder groups co-develop these products. This, however, may require capacity building to ensure that all actors are equally empowered. Furthermore, these products need to be mainstreamed across all levels of decision making. Successful partnerships are mindful of intersectionality and engage issues around gender, equity and inequality.

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