

IPBES template for the submission of requests, inputs and suggestions on short-term priorities and longer term strategic needs that require attention and action by IPBES as part of its future work programme.

Name and contact details of individual submitting requests/inputs/suggestions:

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Submission from: IPBES member:

Observer allowed enhanced participation in line with decision IPBES-5/4:

MEA(s):

Convention on the Conservation of Migratory Species of Wild Animals (UNEP/CMS) and its Agreements (CMS Family);

Convention concerning the Protection of the World Cultural and Natural Heritage.

United Nations body: _____

Expert on, and holder of, indigenous and local knowledge: _____

Other Stakeholder(s): _____

Please provide the following information for any request and, where relevant, for any inputs and suggestions (additional attachments can also be submitted):

Request/input/suggestion:

Request for an assessment on Connectivity Conservation

Information to accompany requests submitted to the Platform (see also Decision IPBES-1/3 Procedure for receiving and prioritizing requests put to the Platform):	
1.	<p>Relevance to the objective, functions and work programme of IPBES:</p> <p>The request is relevant for the Platform’s objective of “strengthening the science-policy interface for the conservation and sustainable use of biodiversity, long-term wellbeing and sustainable development”, since Connectivity Conservation is recognized to be a key element for the conservation of many components of biodiversity.</p> <p>This request is relevant to the following IPBES’s functions: respond to requests from Governments, including those conveyed to it by multilateral environmental agreements related to biodiversity and ecosystem services as determined by their respective governing bodies; identify and prioritize key scientific information needed for policymakers at appropriate scales; perform regular and timely assessments of knowledge on biodiversity and ecosystem services and their interlinkages, which should include comprehensive global, regional and, as necessary, subregional assessments and thematic issues at appropriate scales and new topics identified by science and as decided upon by the Plenary; support policy formulation and implementation by identifying policy relevant tools and methodologies, such as those arising from assessments, to enable decision makers to gain access to those tools and methodologies and, where necessary, to promote and catalyse their further development. This</p>

	<p>request for assessment appears to be also relevant to the current Programme of Work of IPBES and specifically to its Objective 2: Regional & Global Assessments “Strengthen the science-policy interface on biodiversity and ecosystem services at and across subregional, regional and global levels” and Objective 3 “Thematic & Methodological Issues: Strengthen the science-policy interface on biodiversity and ecosystem services with regard to thematic and methodological issues”, depending on the approach that will be chosen for the assessment.</p>
2.	<p>Urgency of action by IPBES in the light of the imminence of the risks caused by the issues to be addressed by such action:</p> <p>Connectivity plays a key role in enabling species and ecosystems to respond to environmental and climate changes. There is evidence that policies concerning land use changes, infrastructure development and others are affecting connectivity through habitat loss, degradation and fragmentation and barriers to animal movement. Loss of connectivity can happen very rapidly and can in many cases be irreversible. An assessment of existing knowledge on conservation connectivity should allow to identify impacts, rectify harmful policies to minimize negative effects on connectivity on one side, and identify important gaps in knowledge on the other.</p>
3.	<p>Relevance of the requested action in addressing specific policies or processes:</p> <p>With reference to the previous point, an assessment of existing knowledge on conservation connectivity should be relevant to policies at different scales concerning land use changes, infrastructure development, climate change adaptation, conservation areas, wildlife management and others. As regards CMS, this request is especially relevant for the implementation of CMS COP12 Resolution 12.26 on "Improving Ways of Addressing Connectivity in the Conservation of Migratory Species"; Resolution 12.07 on “The Role of Ecological Networks in the Conservation of Migratory Species”; Resolution 12.21 on “Climate Change and Migratory Species”; Resolution 11.27 (Rev.COP12) on “Renewable Energy and Migratory Species”. While as regards WHC, this request is especially relevant for Decision 41 COM 7 of the World Heritage Committee.</p> <p>The assessment is also potentially relevant to support the implementation of the Post-2020 Global Biodiversity Framework, insofar as Connectivity Conservation is going to be integrated in the framework.</p>
4.	<p>Geographic scope of the requested action, as well as issues to be covered by such action:</p> <p>The requested action aims to obtain an assessment on Connectivity Conservation and its implications, as explained in detail in the documents attached. The geographic scope of the assessment is global, while the issue of connectivity will have to be considered at appropriate scales, including regional, subregional and migratory range levels.</p>
5.	<p>Anticipated level of complexity of the issues to be addressed by the requested action:</p> <p>The concepts of connectivity and connectivity conservation have been used in different contexts to underpin different aspects of the interlinkages within and between ecosystems and ecological processes. Taken in their different declinations, the concepts are quite broad and include multifaced meanings. Knowledge on many aspects of connectivity is scattered and uneven. For these reasons, the issue to be addressed is expected to be complex.</p>
6.	<p>Previous work and existing initiatives of a similar nature and evidence of remaining gaps, such as the absence or limited availability of information and tools to address the issues, and reasons why IPBES is best suited to take action:</p> <p>There is a significant amount of scientific literature on connectivity published over the last 3 decades. The number of papers on the subject has been constantly growing over the last few years. However, a comprehensive review of existing literature on the subject is not available. Under the CMS there has been some review work, particularly on migratory connectivity, leading to CMS COP12 Resolution 12.26 on "Improving Ways of Addressing Connectivity in the Conservation of Migratory Species". Among other things, the resolution encourages parties and stakeholders to intensify efforts to address threats to the conservation status of migratory species which are manifested as threats to connectivity and requests the sharing of</p>

	<p>information on connectivity within and between the instruments of the CMS Family, biodiversity-related multilateral environmental agreements and others.</p> <p>Examples of other initiatives of similar nature on Connectivity Conservation might include the process under the Convention on Biological Diversity for identifying and describing Ecologically or Biologically Significant Marine Areas, the United Nations Environment Programme Global Connectivity Conservation Project and the IUCN WCPA Connectivity Conservation Specialist Group.</p> <p>In the context of CMS, the recently established Working Group on the development of the CMS Family contributions to the Post-2020 Global Biodiversity Framework, which is composed of members of CMS subsidiary bodies (Standing Committee and Scientific Council), NGOs and the CMS Family Secretariats, agreed that the concept of connectivity conservation needs to be fully integrated into the Post-2020 global framework.</p> <p>The IPBES contributions on assessing Connectivity Conservation would support all the initiatives and processes on this topic. Through identifying and analysing relevant literature, examples, data and experiences on connectivity conservation which are not still well known and understood, IPBES would support further work on the development of adequate policies and guidelines for the conservation of biodiversity and ecosystem services.</p>
7.	<p>Availability of scientific literature and expertise for IPBES to undertake the requested action:</p> <p>In the field of environmental science, there is an extensive scientific literature on connectivity. The Annex of the proposal contains a list of references compiled by the CMS Family and the World Heritage Convention. The bibliography is intended to be purely illustrative and not exhaustive of the available sources.</p>
8.	<p>Scale of the potential impacts, and potential beneficiaries of the requested action:</p> <p>The requested action aims to compile and analyze scientific knowledge on connectivity conservation in order to support the development and the implementation of policies adequate to combating biodiversity loss and preserving the phenomenon of migration. The impact of this action is on a global scale. This action is of direct benefit to migratory species, the maintenance of ecological processes and the functions of ecosystems such as wetlands and protected areas, as well as local communities that benefit from these species and ecosystems. The request action is useful for the conservation of all biodiversity, since connectivity has been identified as a potential critical element in enabling adaptation and resilience to environmental and climate changes.</p>
9.	<p>Requirements for financial and human resources, and potential duration of the requested action:</p> <p>The financial and human resources needed may change depending on the approach that will be chosen to undertake the assessment. The assessment should be ideally ready by 2020.</p>
10.	<p>An identification of priorities within multiple requests submitted:</p> <p>The prioritization can only be based on the availability of literature and data.</p>
11.	<p>Any other relevant information (including a list of any attachments provided):</p> <p>Proposal and its Annex.</p>

Connectivity conservation

Introduction on Connectivity

The scientific concept of connectivity incorporates relationships between key ecological processes and the spatial pattern and scale of vegetation cover, not only in natural landscapes, but also in semi-natural and even highly modified landscapes (Forman 1995). The concept of connectivity has become increasingly important in the past three decades as a result of modification of ecosystems and subsequent declines in biodiversity resulting from a range of direct and/or indirect human influences including vegetation clearing (and resulting habitat loss), altered fire regimes, invasion by exotic species and climate change (Crooks and Sanjayan 2006; Fitzsimons et al. 2013a). Given the multiple and multifaceted meanings of connectivity, it is not surprising that while the concept is universally agreed to be important, it is often conceived very broadly, thereby rendering it difficult to use in practice and sparking much academic debate (for example, on the ecological value of wildlife corridors; see Simberloff et al. 1992; Beier and Noss 1998; Lindenmayer and Fischer 2007).

Connectivity conservation management is a strategic approach to address threats to biodiversity and to help link habitats across whole land-seascapes, which can enable species to move and their ecosystems adapt as conditions change. Connectivity conservation is a way of maintaining connections for nature by involving people. There are other forms of knowledge that are also important and can be included, such as the knowledge systems of indigenous peoples and other local communities (Pulsford, I., Lindenmayer, D., Wyborn, C., Lausche, B., Worboys, G. L., Vasilijević, M. and Lefroy, T. (2015) 'Connectivity conservation management', in G. L. Worboys, M. Lockwood, A. Kothari, S. Feary and I. Pulsford (eds) *Protected Area Governance and Management*, pp. 851–888, ANU Press, Canberra).

With regard to the nature context, connectivity consists of four interacting considerations: 1) landscape connectivity - physical connection of natural vegetation between two otherwise physically isolated, 2) ecological connectivity - connectedness of ecological processes across multiple scales including processes related to highly dispersive species, highly interactive species, disturbance regimes and hydro-ecological flows (Lindenmayer and Fischer 2006; Soulé et al. 2006; Mackey 2007; Mackey et al. 2013), 3) habitat connectivity - connectedness between patches of suitable habitat for an individual species, and 4) evolutionary process connectivity, including the degree of habitat fragmentation, the presence of remnant habitat stepping stones and opportunities to rehabilitate connections in the context of climate change and other threats (Pulsford, I., Lindenmayer, D., Wyborn, C., Lausche, B., Worboys, G. L., Vasilijević, M. and Lefroy, T. (2015) 'Connectivity conservation management', in G. L. Worboys, M. Lockwood, A. Kothari, S. Feary and I. Pulsford (eds) *Protected Area Governance and Management*, pp. 851–888, ANU Press, Canberra).

Migratory Connectivity

Migratory connectivity has been defined in several different ways (Table 1). Basically, the main difference in these definitions is that they consider migratory connectivity as a property of different entities: geographical areas, individuals or groups of individuals, populations, or even time periods. Importantly, the different perspectives on migratory connectivity may serve different purposes. For instance, considering connectivity as a property of geographical areas may matter for conservation purposes, as it allows identifying areas through which individuals move, and to act to lessen the threats that may hamper survival in each of these areas. In contrast, considering connectivity as a property of individuals may matter for evolutionary or genetic studies of populations as well as for applicative purposes, for instance transmission of parasites and pathogens among individuals that mix at some stages of their annual life-cycle.

Table 1: Examples of different definitions of migratory connectivity present in literature (list not exhaustive).

Definition	Property of	Reference
The links between breeding and non-breeding areas due to the movement of migrants among them	Areas	(Webster et al. 2002)
The extent to which individuals from the same breeding area migrate in the same non-breeding area and vice versa	Individuals	(Webster et al. 2002)
The geographic linking of individuals or populations between different stages of the annual cycle	Individuals / Populations	(Marra et al. 2006)
Migratory connectivity refers to the degree to which two or more periods of the annual cycle are geographically linked	Periods	(Boulet and Norris 2006)
Migratory connectivity describes the degree to which individuals or populations are geographically arranged among two or more periods of the annual cycle	Individuals / Populations	(Boulet and Norris 2006)
Migratory connectivity describes the associations between breeding sites, stopovers and wintering grounds of groups of individuals	(Groups of) Individuals	(Veen 2013)
The geographic link between individuals or populations at different stages of their annual cycle	Individuals / Populations	(Rundel et al. 2013)

For the purpose of this document, we broadly consider migratory connectivity as describing the spatial and temporal linkages of individuals and populations between seasons or different stages of the migration cycles that result from migratory movement. This definition covers to some extent both the structural and functional aspects of the other types of nature connectivity.

The evolution of recent thinking on Migratory Connectivity issues has drawn particular attention to:

- the need to express conservation objectives in terms of whole migration systems, and in terms of what is needed for the functioning of the migration process itself, not just the status of populations or habitats;
- the opportunity to define actions addressed at the connections between places (or times);
- the opportunity to improve connectivity by correcting the most obvious instances of problematic discontinuity in migration systems, such as barriers to migration, fragmented resources, disrupted ecological processes, genetic isolation, altered behaviour patterns, disconnections in distribution caused by climate change or depletion of food or water resources, inconsistencies in management across and beyond national jurisdictions, and other factors;
- the need to work with a wide range of stakeholders in government authorities, local communities, the private sector and others at a variety of scales including the landscape and seascape scale to promote the restoration and management of habitats used by migratory species with particular regard to issues of connectivity;
- the importance of developing understanding about the links between connectivity and resilience.

Assessing migratory connectivity is fundamental to identify when and where in a cycle certain vital aspects (e.g. reproduction) are being affected. Such knowledge is fundamental to understanding how the events through such cycle interact and so to identify how the events affect individuals and population in subsequent periods.

Migratory connectivity is key in any land-use and spatial planning as well as in the development of networks of sites or protected areas managed for conservation purposes.

Regional case study

The extension of ecological barriers within the Palaearctic-African migratory system is increasing; the Sahara is progressively extending to the south, due to desertification caused both by direct (e.g., destruction of vegetation due to direct use of timber) or indirect (e.g., growing temperatures as an effect of climate change) human impact. The extent of equatorial forests is decreasing as well, and their destruction is primarily affecting the boundaries of the forests, causing a southbound retreat of this highly vulnerable habitat. Hence, the overall distance between the northernmost limit of forests and the southern edge of the Sahara is also increasing.

The maximum amount of energy a bird can store (both in terms of fat and flight muscles enlarged before migration) has a physical limit related to aerodynamic and metabolic thresholds. This implies a limit also in the overall distance a migrant can fly across ecological barriers without being in need of refuelling.

The progressive extension of the ecological barriers can lead to major physiological challenges for birds whose maximum possible flight range can become insufficient to effectively cross such barriers.

The actions undertaken to halt or reduce soil erosion through the planting of green belts especially within the Sahel can be monitored, in their effects on biodiversity conservation, by using birds as indicators of the outcomes of such initiatives.

Request to IPBES

Following CMS Resolution 12.26, IPBES could give special attention to:

- Evaluating the sufficiency and coherence of ecological networks in functional and qualitative terms as well as in terms of extent and distribution and to the desirability of sharing experiences and best practices on this issue;
- Assessing the effectiveness of the protection and management of the areas and networks, examining particularly the case studies and requirements for connectivity conservation of international site designations, including Ramsar and World Heritage, with a view to promote large-scale connectivity conservation initiatives through the biodiversity-related conventions.

Following CMS Decision 12.92 (Directed to the Scientific Council), IPBES could enhance the scientific understanding of connectivity issues in relation to migratory species through:

- Reviewing the scope for existing major databases to support relevant analyses and syntheses of information on connectivity, and identify options *inter alia* for ensuring sustainability and enhanced operability and coordination of such databases for this purpose;
- Investigating options for creating relevant data and knowledge holding capabilities and for enhancing analysis capabilities, in collaboration with suitably qualified institutions and processes;
- Investigating and report on the linkages between migratory species connectivity and ecosystem resilience;
- Having regard in particular to the Strategic Plan for Migratory Species, assessing the needs and developing focused objectives for new research on key connectivity issues, including but not limited to climate change, which affect the conservation status of each of the major taxonomic groups of migratory wild animals.

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