

**Article title:** Research priorities for maintaining biodiversity contributions to people in Latin America

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1 **Research priorities for maintaining biodiversity's contributions to people**  
2 **in Latin America**

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15 *Keywords:* Ecosystem services, environmental change, capacity building, investment in  
16 research, data availability, knowledge systems, governance

17

18 ***Abstract:*** *Maintaining biodiversity is crucial for ensuring human well-being. We participated*  
19 *in a workshop held in Palenque, Mexico, in August 2018, that brought together thirty mostly*  
20 *early-career scientists working in different disciplines (natural, social and economic*  
21 *sciences) with the aim of identifying research priorities for studying the contributions of*  
22 *biodiversity to people and how these contributions might be impacted by environmental*  
23 *change. Five main groups of questions emerged: (1) Enhancing the quantity, quality, and*  
24 *availability of biodiversity data; (2) Integrating different knowledge systems; (3) Improved*  
25 *methods for integrating diverse data; (4) Fundamental questions in ecology and evolution;*

26 *and (5) Multi-level governance across boundaries. We discuss the need for increased*  
27 *capacity building and investment in research programs to address these challenges.*

28

29

30 Biodiversity contributes to people's quality of life, for example by pollinating crops,  
31 controlling pests, promoting soil fertility, and providing goods and aesthetic pleasure.

32 Maintaining biodiversity to secure the supply of these benefits is crucial for ensuring human  
33 well-being, including through economic development and poverty alleviation (IPBES 2019).

34 We participated in a workshop held in Palenque, Mexico, 28-30 August 2018, that brought  
35 together thirty mostly early-career scientists working in different disciplines (natural, social  
36 and economic sciences) from across Latin America and the UK. Our aim was to identify  
37 research priorities for studying the manifold contributions of biodiversity to people and how  
38 these contributions might be impacted by environmental change. The workshop focused on  
39 Latin America, which has particular challenges related to conserving globally significant  
40 biodiversity while addressing social and economic problems (Balvanera *et al.*, 2012), but all  
41 of the points discussed will resonate with similar challenges in other regions of the world.

42

43 Here we provide a summary of the key research priorities identified in the workshop.

44 Research priorities were identified through a series of break-out discussion groups followed  
45 by plenary discussions in which participants first identified a broad set of candidate  
46 questions, before iteratively paring the long list down and grouping them by topic.

47 Discussions centred around key research questions that need to be answered to inform policy  
48 decision-making. We also discussed the feasibility of answering each question, and the  
49 funding and capacity building mechanisms that will be needed. Our list is by no means  
50 exhaustive and is subjective in so far as it is based on expert opinion of those participating in

51 the workshop, but we see particular value in this being the opinions of early-career  
52 researchers who will themselves push forward this research agenda over the coming decades.

53 **Our goal here is to share the overarching conclusions of our workshop with a view to**  
54 **stimulating future in-depth research into these important topics.**

55

### 56 **Priority research questions**

57 Five main groups of questions emerged, which we summarize below and in Table 1. A first  
58 topic centred around how the quantity and quality of data relating to biodiversity could be  
59 enhanced, and how those data could be made more widely available to diverse users. High  
60 quality baseline data relating to multiple dimensions of biodiversity – genetic, taxonomic,  
61 phylogenetic, and functional – is often lacking and yet is fundamental to understanding  
62 responses to environmental change. We therefore identified a need to establish more rapid  
63 biodiversity assessment programs, to strengthen long-term monitoring programs, to use  
64 standardized collection protocols, and to use modern technologies such as eDNA and remote  
65 sensing to capture data. Moreover, although significant progress in data sharing has been  
66 achieved in recent years (e.g., through the Global Biodiversity Information Facility, GBIF),  
67 data are too often inaccessible to relevant stakeholders. More activity in compiling large  
68 datasets (e.g., Salguero-Gómez *et al.*, 2014; Salguero-Gómez *et al.*, 2016; Jones *et al.*, 2009;  
69 Kattge *et al.*, 2011) is needed, and as a community we need to incentivise data sharing, for  
70 instance through promotions criteria that recognize contributions to shared repositories (e.g.,  
71 Navarro-Sigüenza *et al.*, 2003).

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77 **Table 1.** Key areas for future research with example priority research questions.

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**Enhancing the quantity, quality, and availability of biodiversity data**

How can we accelerate the collection of biodiversity data?

How can we facilitate access to and sharing of ecological, environmental, and socially relevant data?

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**Integrating different knowledge systems**

Does incorporating different world views result in better management of biodiversity and the associated benefits for humans?

How do power imbalances influence the integration of different values in the governance of ecosystem services?

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**Improved methods for integrating diverse data**

How can we best integrate data from various sources and across different spatial and temporal scales?

How can we improve the uptake of methods that consider uncertainty, ecological interactions, non-linear and synergistic effects?

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**Fundamental questions in ecology and evolution**

How does the distribution of genetic variation across the genome and across species' geographical ranges determine capacity for evolutionary adaptation to rapid anthropogenic change?

How sensitive are ecological communities to perturbation, how robust are they to species loss, and what aspects of the community determine this?

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**Multi-level governance across boundaries**

How can we conserve, restore or enhance ecosystems and biodiversity, and associated benefit and detriment flows, that extend across local or national boundaries?

How can (or should) nested scales of governance (local, national, international; public, private) be coordinated and reformed to enhance benefits to people from biodiversity and ecosystems?

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78

79 A second set of questions focused on the challenge of integrating different world views and  
80 value systems. The Intergovernmental Science-Policy Platform on Biodiversity and  
81 Ecosystem Services (IPBES) has adopted a framing that uses the notion of “nature’s  
82 contributions to people” (NCP; Díaz *et al.*, 2018), which fully includes, but goes beyond, that  
83 of ecosystem services. The NCP approach recognizes the role that culture plays in defining  
84 links between people and nature, and incorporates local and traditional knowledge (Berkes  
85 2012) alongside that of Western science. This raises important questions about how exactly  
86 different world views can be integrated in biodiversity studies and whether doing so results in  
87 better management of benefits and detriments to people. Central to these questions will be  
88 issues relating to power imbalances, since power dynamics strongly influence what aspects of

89 biodiversity are prioritized for research and are particularly relevant to the quality of life of  
90 marginalized people.

91

92 Our third category of questions included diverse issues relating to the need for improved  
93 methods of analysis. As increasing quantities of data are made available from different  
94 sources, at varying spatial and temporal scales, and relating to diverse phenomena in natural  
95 and social sciences, there is a need for more transdisciplinary methods that can help us to  
96 make sense of these rich sources of information. Such methods will need to incorporate  
97 robust ways to deal with uncertainty, and must allow for the consideration of complex, non-  
98 linear, and delayed responses resulting from ecological interactions (e.g., Staniczenko *et al.*,  
99 2017) and synergies between threats (e.g., Brook *et al.*, 2008).

100

101 A fourth set of questions focused on areas of research that are currently hot topics in ecology  
102 and evolutionary biology, and that are deemed of key importance for ensuring adequate  
103 management of biodiversity and the sustainability of its contributions to people. A wealth of  
104 questions was discussed relating to the responses of individuals, populations, species, and  
105 communities to environmental perturbations, and the functional responses that will define the  
106 benefits that people derive from nature. In some cases the questions related to classic debates  
107 (such as concerning the relationship between diversity and stability; Cardinale *et al.*, 2012)  
108 and there was scepticism that they would be answered in the next five to ten years. However,  
109 several questions were viewed as both pressing in an applied sense and also feasible to  
110 answer in light of new methods, particularly with regard to generating a more mechanistic  
111 understanding of how biodiversity responds to anthropogenic change.

112

113 A final set of questions concerned governance challenges, especially relating to the  
114 transboundary management of biodiversity and ecosystems, and the links between public and  
115 private sectors. Transboundary management is essential given the globalised or transnational  
116 nature of environmental change drivers, and the spatial misalignment of governance  
117 boundaries and ecosystems. This also relates to the need for biodiversity datasets that extend  
118 across multiple countries and are widely available in standardized formats, in line with the  
119 first category of questions that we identify above. Governance reforms will be necessary to  
120 meet each country's international commitments, such as under the Convention on Biological  
121 Diversity and through the Sustainable Development Goals, yet further research is needed as  
122 to how collective decision making, institutions and norms can or should mediate, allocate or  
123 otherwise influence flows of benefits to people from ecosystems and biodiversity.

124

125 **What is needed to answer the questions?**

126 Latin America will play an important part in the future of global change at the planetary  
127 scale; for example, deforestation in the Amazon and melting of Patagonia's glaciers will  
128 strongly affect the hydrological cycle and climate across the Americas and possibly beyond.  
129 Yet most nations in Latin America have biodiversity and ecosystem research low down their  
130 agendas. Enhancing human well-being requires that we increase efforts to protect and restore  
131 the many ways in which biodiversity contributes to people and ensure that those contributions  
132 are long lasting and accessible to all. In order to foster and accelerate research that will  
133 address the key questions that we have identified, we recommend: (1) A focus on capacity  
134 building to educate transdisciplinary researchers, increase transboundary training, meet  
135 training needs in less well-served regions, and retain young researchers in the region; and (2)  
136 Investment in research programs that are transdisciplinary, support international collaboration  
137 across the region and beyond (such as through the Newton Fund that funded our workshop),

138 are long-term, and are of sufficient magnitude to realistically address these challenging  
139 research needs.

140

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149

#### 150 **Author contributions**

151 RP, EMM, SD and PM led the workshop. All authors participated in discussion sessions at  
152 the workshop and contributed to the report. Authors 3-28 are listed alphabetically.

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