Conservation needs to break free from global priority mapping

Global priority maps have been transformative for conservation, but now have questionable utility and may crowd out other forms of research. Conservation must re-engage with contextually rich knowledge that builds global understanding from the ground up.

Carina Wyborn and Megan C. Evans

Conservation research has roots in the ecological and biogeographic sciences, which frequently investigate the spatial distributions of ecosystems, species, populations and genes. Given these disciplinary foundations, the primacy of spatial prioritization for conservation research and action is unsurprising[1]. The 1990s and 2000s saw a surge in the creation of global conservation priority maps (hereafter 'global maps'). These maps were undoubtedly transformative for conservation[2]: they placed biodiversity on a world stage, catalysed systematic conservation planning[3], redirected the work of international organizations, and raised substantial funding for conservation[4]. But now, two decades after Myers and colleagues published their famous 'hotspots' paper[5], we suggest that the sheer volume and accelerating production of global maps is becoming counterproductive for conservation. Here, we argue that global maps constitute a particular, and problematic, form of global knowledge that erases local context and difference[6]. We interrogate the purposes of global maps and their underpinning assumptions and highlight the costs of increasingly globalized conservation knowledge. We argue that the conservation community needs to critically assess the value of global maps and consider alternative ways of generating a global picture of biodiversity conservation needs.

Why are there so many global maps?

In a review of the literature, we identified more than 150 peer-reviewed journal articles published since 2000 that conduct a spatial prioritization or mapping analysis for conservation at the global scale (see Supplementary Fig. 1). Three broad categories emerged: delineation of new conservation priorities (34% of the 150 papers); spatial analyses of existing global priorities (such as degree of overlap with other priorities or values; 29%), or other global maps that could inform a formal prioritization (for example, maps of forest integrity, or papers fitting into a 'last of the wild' theme; 38%). This analysis should not be viewed as comprehensive, but is indicative of the volume and growth of global maps in conservation, as well as the stated and unstated reasons for their development.

International non-governmental organizations (NGOs) have successfully used global maps to identify target geographies and inform resource allocation[2], but the activities of such organizations cannot entirely explain (or be informed by) the continued and accelerating production of global maps. More broadly, it is assumed that global maps and associated data inputs are required to inform global policy development and implementation, such as under the United Nations Convention on Biological Diversity (CBD)[7]. Yet it is difficult to evaluate the impact of these analyses among the geo-political and advocacy forces that shape decision-making at the CBD[8]. The pursuit of global knowledge is underpinned by an assumption that global policies are required to address global problems and mobilize change[9]. Decades of gridlock in the climate arena suggest that such assumptions should be questioned. Moreover, most conservation decisions do not occur at the global scale: they are made by a diverse array of distributed actors operating from individual decisions up to national and sometimes transnational arenas.

Global maps embody a technocratic view of environmental decision-making that assumes rational uptake of knowledge to inform decisions[9] — in fact, conservation decision-making is complex and messy[10]. Global maps may provide a useful 'first cut' analysis, but they often bear little resemblance to the conservation action and expenditure that ultimately occurs[11]. A core logic underpinning many global mapping exercises is to produce increasingly high-resolution datasets that could inform conservation decisions anywhere on the planet[12]. Global maps of deforestation can illustrate forest loss in contexts where national data may not be trustworthy[13], or across globally distributed supply chains[14]. Global datasets could provide useful inputs into regional and local planning and decision processes, particularly in areas where local technological capacity and data are limited. But this only rarely occurs[15]. Instead, the importance of local and regional knowledge for biodiversity has been emphasized by the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES). Recognizing the problems of a purely global frame for biodiversity, IPBES aims to build multi-scaled models, scenarios and assessments[16].

Spatial prioritizations are not always intended for implementation. They may instead aim to foster technical advancements that improve models or modelling techniques[17]. But this intention is rarely stated explicitly and is perhaps questionable given that the word 'prioritization' implies that maps are intended to inform conservation priorities. We argue that there is a tendency to overstate the policy relevance of global maps, which could stem from their logical appeal of providing a nominally objective 'view from everywhere'[6], whereby a wider audience is likely to relate to the science contained within. Global scale analyses may be more salient for international audiences and the media, but there is a risk that globalized knowledge may 'crowd out' empirical and contextually rich local- and regional-scale studies that align more closely with the scale of conservation investment and action.

The costs of globalized conservation knowledge

Global data are required to generate a global map, yet biodiversity is a local phenomenon. To generate reliable and useable global biodiversity data, specialized knowledge, time and resources are required. This creates

several challenges. First, taxonomic and regional biases in conservation research[18] inevitably mean that representations of particular geographies in global maps will misrepresent local realities through assumptions about the presence/absence of particular species or ecosystems. Second, globalizing biodiversity data necessarily requires decontextualization and standardization[19]. Difference, heterogeneity and complexity are flattened when a global and uniform picture is constructed and given precedence[9]. Third, maps require particular kinds of knowledge that can be represented in a data layer. This perpetuates a dominance of Western scientific knowledge of biodiversity over that of Indigenous and local knowledges that cannot readily be expressed in quantitative formats easily represented in a map[20]. Finally, and relatedly, the quantitative bias in maps creates an inherently difficult space for inter/transdisciplinary collaboration because qualitative data are rendered irrelevant, while poorly analogous global data are used to represent social and political phenomena so that maps can claim the status of including social-ecological representation.

Neutrally framed scientific maps create images of where nature should exist, where people belong, and which components of biodiversity or which places matter for conservation. But these scientific representations of nature are not objective: they instead reflect the values and interests of those who construct them, and are inherently subjective owing to the values, culture and epistemic blinkers of individual scientists[21]. This subjectivity is concealed when maps become a 'disciplined and normalized' way of seeing the world, where the technical process underpinning their construction, and the power of those who construct the image, is lost[20]. This matters because biodiversity knowledge both represents and constitutes the ways in which we govern biodiversity, through choices that scientists make about which audiences matter, what information they may want, and what types of policy actions can flow from that knowledge[9]. When those creating the global maps emanate from privileged Western institutions, maps perpetuate a neo-colonial legacy by shaping where and how biodiversity should be conserved.

The search for a quantifiable, universal format that is amenable to integration into a GIS layer when constructing a global map, and an algorithm when undertaking a prioritization, erases epistemic, cultural and geographic differences. This 'view from everywhere' misrepresents local contexts and operates at a granularity that means global maps cannot support the development of contextually relevant solutions that build on the knowledge, experience and values of local actors[6]. More problematically, if 'solutions' are to be derived from such global representations of a local, national or regional context, they risk further exacerbating conservation problems because they have been developed on an inaccurate representation of local social-ecologies.

A theory of change for global maps

Ultimately, the value and efficacy of global conservation prioritization maps should be judged within the context of their use[20], yet to do this, there needs to be clarity on their intended outcome and context of application. We call on the scientific community to be clear about the underlying theory of change embedded within the construction of these maps — what changes are global maps, and their creators, trying to bring about in the world?

The paucity of maps used within national climate or biodiversity strategies under the United Nations Framework Convention on Climate Change (UNFCCC) and CBD[15] indicates a disconnect between the expenditure of research effort to generate these maps and the interface between global objectives and national policies. As such, we call for research to assess whether the global maps being generated are meeting global-scale decision-making needs, and to empirically examine why these maps are not being used to inform national strategies under the UNFCCC and CBD. If the policy target of global mapping projects is the CBD's post-2020 Global Biodiversity Framework, then it is important to recognize the power imbalances associated with the dominance of Western institutions and ways of knowing in the construction of global maps and the ethical implications of institutionalizing these maps into a global governance framework. We question whether the dominant focus of governments and NGOs on the protected area target — as a tangible, measurable and easily quantifiable spatial target — is incentivizing the production of mapping exercises as the conservation community seeks to identify which parts of the Earth should be in the 30%, a debate that rarely focuses on whether those protected areas are equitably and effectively managed[22].

Second, we implore research funders, conservation NGOs, and academic journals to be more critical of their role in perpetuating the dominance of global maps. There appears to be a self-perpetuating cycle that incentivizes the construction of global maps through their publication in high-profile journals, the press releases and media attention they gain, which elevates the profile of individual scientists and their labs, who then attract more funding to do yet another global analysis[23]. Headlines and advocacy campaigns characterized by simplistic messages belie the complexity of processes that shape conservation decision-making. Research is needed to identify whether global maps are raising awareness with decision-makers, or the public more broadly. Such research could consider whether the proliferation of maps is creating clear and actionable messages to inform conservation decisions at appropriate scales, and whether they are actually providing appropriate decision support for conservation prioritization.

Towards situated knowledge and practice

Finally, we argue that conservation and ecology should re-engage with and embrace empirical studies of local and regional contexts. At this scale, knowledge can be co-constructed with those who have an intimate understanding of place, and/or have the agency to facilitate change. Such research can be developed to meet a specific need, and can be tailored for the decision-making context of use. From these studies, an understanding of global conservation needs can be constructed from the 'ground up', drawing on a rich understanding of empirical context, rather than a view from everywhere that is modelled according to data availability. There are examples from which lessons can be drawn: the Multiple Evidence Base framework developed to support the integration of local and traditional knowledge into the IPBES pollination assessment and the CBD action plan for the customary use of biodiversity[24]. These processes involved multiple engagements with local biodiversity knowledge holders who worked to provide an evidence base that was used to inform global governance processes. The Global Atlas of Environmental Justice (EJAtlas) provides an example of how a global picture can be created through a crowdsourced database that compiles local knowledge of environmental conflicts[25]. These examples emphasize the need to embrace the different ways of knowing biodiversity, and the importance of creating an enriched picture of the global scale that is grounded in diverse and contextual insights that cannot be distilled to a singular quantitative perspective. Adopting these lessons to inform global mapping projects would require a pivot in research, education and practice that underpins conservation, to reprioritize context, diversity and transdisciplinarity.

Ultimately, we urge the conservation community to think critically about whether another global analysis is really needed, what context it might be used within and for what purposes. This would involve engaging with conservation decision-makers, and asking them: "What knowledge is needed to enable decision-making in this context? How is this knowledge going to be used to mobilize change? And whose priorities are being prioritized?" We suspect that these questions may be answered with some hard truths: that global maps are not needed and scientific knowledge may not be the limiting factor in driving change. ❐

Carina Wyborn[1]✉ and Megan C. Evans[2]

[1]Institute for Water Futures, Fenner School of Environment and Society, The Australian National University, Canberra, Australian Capital Territory, Australia. [2]Public Service Research Group, School of Business, University of New South Wales, Canberra, Australian Capital Territory, Australia.
✉*e-mail: carina.wyborn@anu.edu.au*

Published online: 23 August 2021
https://doi.org/10.1038/s41559-021-01540-x

References

1. Evans, M. *Environ. Conserv.* https://doi.org/10.1017/S0376892921000114 (2021).
2. Brooks, T. M. et al. *Science* **313**, 58–61 (2006).
3. Margules, C. R. & Pressey, R. L. *Nature* **405**, 243–253 (2000).
4. Myers, N. *Bioscience* **53**, 916–917 (2003).
5. Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B. & Kent, J. *Nature* **403**, 853–858 (2000).
6. Hulme, M. *Glob. Environ. Change* **20**, 558–564 (2010).
7. Kullberg, P. & Moilanen, A. *Nat. Conserv.* **12**, 3–10 (2014).
8. McIntosh, E. J., Pressey, R. L., Lloyd, S., Smith, R. J. & Grenyer, R. *Annu. Rev. Environ. Resour.* **42**, 677–697 (2017).
9. Turnhout, E., Dewulf, A. & Hulme, M. *Curr. Opin. Environ. Sustain.* **18**, 65–72 (2016).
10. Evans, M. C., Davila, F., Toomey, A. & Wyborn, C. *Nat. Ecol. Evol.* **1**, 1588 (2017).
11. Halpern, B. S., Regan, H. M., Possingham, H. P. & McCarthy, M. A. *Ecol. Lett.* **9**, 2–11 (2006).
12. Mokany, K. et al. *Proc. Natl Acad. Sci. USA* **117**, 9906–9911 (2020).
13. Moffette, F., Alix-Garcia, J., Shea, K. & Pickens, A. H. *Nat. Clim. Change* **11**, 172–178 (2021).
14. zu Ermgassen, E. K. H. J. et al. *Environ. Res. Lett.* **15**, 035003 (2020).
15. Schmidt-Traub, G. *Nat. Ecol. Evol.* https://doi.org/10.1038/s41559-021-01533-w (2021).
16. Obermeister, N. *Sustain. Sci.* **14**, 843–856 (2019).
17. Sinclair, S. P. et al. *Conserv. Lett.* **11**, e12459 (2018).
18. Mammides, C. et al. *Biol. Conserv.* **198**, 78–83 (2016).
19. Turnhout, E. & Boonman-Berson, S. *Ecol. Soc.* **16**, 35 (2011).
20. Malavasi, M. *Biol. Conserv.* **252**, 108843 (2020).
21. Lahsen, M. & Turnhout, E. *Environ. Res. Lett.* **16**, 025008 (2021).
22. Barnes, M. D., Glew, L., Wyborn, C. & Craigie, I. D. *Nat. Ecol. Evol.* **2**, 759–762 (2018).
23. Popkin, G. *Science* https://doi.org/gpzx (24 October 2019).
24. Tengö, M. et al. *Curr. Opin. Environ. Sustain.* **26–27**, 17–25 (2017).
25. Temper, L., del Bene, D. & Martinez-Alier, J. *J. Political Ecol.* **22**, 255–278 (2015).

Competing interests

The authors declare no competing interests.

Additional information

Supplementary information The online version contains supplementary material available at https://doi.org/10.1038/s41559-021-01540-x.