Focus Issue: Mountain Biodiversity and Sustainable Development

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Dear Readers,

The adoption of three mountain-specific targets (6.6, 15.1, and 15.4) and two mountain-specific indicators (15.4.1 and 15.4.2) in the UN 2030 Agenda for Sustainable Development is an important achievement. By placing mountains in such a prominent position in global endeavors for a sustainable future, the international community recognized mountain ecosystems and their biodiversity as environmental commons (Messerli et al 2019) that need to be safeguarded in view of the growing challenges brought about by human activities. And yet, global reporting on the status of, and trends in, mountain ecosystems and their biodiversity is lagging behind: "mountain ecosystems (target 15.4) are seldom mentioned" in Voluntary National Reviews on progress towards the 2030 Agenda (Pesce et al 2020). This is concerning given that mountains are experiencing particularly rapid environmental change (eg Pepin et al 2015), are hotspots of endemic, rare, and threatened species (Rahbek et al 2019), and support ecosystem services that are essential to life on Earth and to the lives of hundreds of millions of people (Martin-López et al 2019).

Two contributions in this focus issue provide effective illustrations of how important mountain ecosystems and their biodiversity are for people. According to Ud Din and colleagues, the economic benefits that local communities derive from nature in two National Parks in the Karakoram–Pamir of northern Pakistan each year are 10–15 times higher than the mean annual household income. Benefits are largely derived from provisioning ecosystem services, which is also the case in the 6 communities of western Nepal studied by Bhatta and co-authors. Yet, discussions and interviews with Nepalese villagers also point to the importance of cultural services for people's wellbeing.

*What makes mountain ecosystems and their biodiversity so valuable for people is also what makes them so vulnerable in the face of growing human demand. In this focus issue, recognizing ecosystem services that different community segments derive from nature and estimating their value emerges as an important measure to address ecosystem degradation, biodiversity loss, and nature conservation in Pakistan and Nepal. The same applies in the Sikkim Himalaya, where Pradhan and co-authors show that both the economic importance of caterpillar fungus (*Ophiocordyceps sinensis*) sales and unregulated markets represent a major threat to the species and its alpine habitats. Looking at the entire Hindu Kush Himalayan region in their MountainAgenda article, Kotru and colleagues promote a landscape approach to management, biodiversity conservation, and sustainable development in mountains. They illustrate the relevance of this approach based on 4 transboundary landscape conservation and development initiatives led by the International Centre for Integrated Mountain Development and its partners.*

*Besides growing human demand for goods, services, and for the land that serves as natural habitat for wild species—as discussed by Srivastava and colleagues in a case study on wild mammals in the Western Himalaya—mountain ecosystems and their biodiversity are exposed to multiple other stressors and processes of global change. Air pollution is one of them, which has caused major declines in forest coverage on the upper plateau of the Czech Republic's Jizera Mountains. How various autochthonous tree species were successfully reintroduced to young spruce (*Abies *spp.) dominated forests using a new management-oriented diversification approach is the topic of the contribution by Kuneš and co-authors in the MountainDevelopment section. Other drivers of change include invasive species and climate change, which are the focus of the article by Sharma Poudel and colleagues. Based on models, these authors estimate the distribution of the crofton weed,* Ageratina adenophora *(Sprengel) R. King and H. Robinson—one of the world's most aggressive invasive weeds—in the Chitwan–Annapurna Landscape of Nepal under current and future climate change trajectories. Predicted range expansion and upslope migration into protected areas call for effective management measures to prevent the negative impacts of invasion on natural ecosystems. Climate change also serves as context for Fomin and co-authors, who analyze the spatiotemporal dynamics of larch trees along the upper limit of their growth range in the Rai-Iz mountain massif of Russia's Polar Urals over the last 50 years.*

The MountainAgenda contribution by Payne and colleagues is about it all: mountain biodiversity, ecosystem services, human wellbeing, direct and indirect drivers of change, and instruments to support the management and conservation of mountain ecosystems and biodiversity. The comparative assessment of 631 abstracts pertaining to the Andes, the East African Mountains, the European Alps, and the Hindu Kush Himalaya reveals interesting differences between mountain systems, especially regarding the relative importance given in the literature to individual drivers of change and to the ecosystem services delivered along elevational gradients. The full assessment is available as supplementary material. The article ends with 6 recommendations that point towards opportunities to improve our knowledge and systematic understanding of these components. By looking at soil macroinvertebrates in different land use types, Damisch and co-authors address one of these recommendations, namely to improve the taxonomic coverage in mountain research. In their MountainDevelopment article, Báez and colleagues echo another of the recommendations: to generate knowledge that is relevant for transformative action towards sustainable mountain development. Based on an analysis of grant applications, their discussion focuses on the need for specific funding vehicles to support such place-based, interdisciplinary, and transformative research and to promote women in the community of practice.

This focus issue also includes a MountainPlatform contribution, in which Reynard and colleagues present the recently established Interdisciplinary Centre for Mountain Research (ICMR), as well as a MountainMedia section with reviews of 3 recent books relevant to sustainable development in mountains.

In the early 1990s, Myers (1993) challenged the implicit assumption that future generations could manage with far less than "a full planetary stock of species." About quarter of a century later, evidence that this assumption was wrong and that people depend on well-conserved and sustainably managed biodiversity for their wellbeing and a sustainable future is plentiful. Evidence is in fact sufficient to support the claim that it

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will be impossible to achieve the UN Agenda for Sustainable Development unless we take radical measures to conserve biodiversity and use its components in a sustainable manner (CBD 2018). Mountain species make up a large part of this planetary stock of species (Rahbek et al 2019). The various contributions to this focus issue offer additional evidence of these species' importance for human livelihoods and wellbeing. However, authors also emphasize the urgent need to adopt conservation and management approaches that can help prevent rapid erosion of our mountains' natural assets and ensure a sustainable future for mountain communities. Ongoing negotiations towards the post-2020 global biodiversity framework offer a unique opportunity to campaign for mountains, for rigorous monitoring of their ecosystems and biodiversity (UNEP et al 2020), and for the formulation of mountain-specific indicators of progress towards halting species loss and ecosystem degradation. International Mountain Day 2020 on 11 December, with its focus on mountain biodiversity, will be a timely occasion to remind the scientific and policy communities at large of the importance of mountain ecosystems and their biodiversity for life on Earth. It will also serve as an opportunity to reiterate the need for concerted disciplinary, interdisciplinary, and transdisciplinary science "to understand, predict, and sustainably manage mountain biodiversity in support of human wellbeing" (Payne et al 2017).

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REFERENCES

CBD [Convention on Biological Diversity]. 2018. Biodiversity at the Heart of Sustainable Development: Input to the 2018 High-Level Political Forum on Sustainable Development (HLPF). Secretariat of the Convention on Biological Diversity (CBD), 27 April 2018. https://sustainabledevelopment.un.org/content/documents/18277CBD_input_to_2018_HLPF.pdf; accessed on 6 July 2020.

Martín-López B, Leister I, Cruz PL, Palomo I, Grêt-Regamey A, Harrison PA, Lavorel S, Locatelli B, Luque S, Walz A. 2019. Nature's contributions to people in mountains: A review. *PLOS ONE* 14(6):e0217847. https://doi.org/10.1371/journal.pone.0217847.

Messerli P, Kim EM, Lutz W, Moatti J-P, Richardson K, Saidam M, Smith D, Eloundou-Enyegue P, Foli E, Glassman A, Hernandez Licona G, Murniningtyas E, Staniškis JK, van Ypersele J-P, Furman E. 2019. Expansion of sustainability science needed for the SDGs. *Nature Sustainability* 2(10):892–894. https://doi.org/10.1038/s41893-019-0394-z.

Myers N. 1993. Biodiversity and the precautionary principle. *Ambio* 22(2/3):74–79.

Payne D, Spehn EM, Snethlage M, Fischer M. 2017. Opportunities for research on mountain biodiversity under global change. *Current Opinion in Environmental Sustainability* 29:40–47. https://doi.org/10.1016/j.cosust.2017.11.001.

Pepin N, Bradley RS, Diaz HF, Baraer M, Caceres EB, Forsythe N, Fowler H, Greenwood G, Hashmi MZ, Liu XD, Miller JR, Ning L, Ohmura A, Palazzi E, Rangwala I, Schoener W, Severskiy I, Shahgedanova M, Wang MB, Williamson SN, Yang DQ. 2015. Elevation-dependent warming in mountain regions of the world. *Nature Climate Change* 5:424-430.

Pesce F, Allison H, Pretorius C. 2020. *Integrating Biodiversity into the Sustainable Development Agenda: An Analysis of Voluntary National Reviews*. Cambridge, UK: UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC).

Rahbek C, Borregaard MK, Colwell RK, Dalsgaard B, Holt BG, Morueta-Holme N, Nogues-Bravo D, Whittaker RJ, Fjeldså J. 2019. Humboldt's enigma: What causes global patterns of mountain biodiversity? *Science* 365(6458):1108–1113. https://doi.org/10.1126/science.aax0149.

UNEP [United Nations Environment Programme], GRID-Arendal, GMBA [Global Mountain Biodiversity Assessment], MRI [Mountain Research Initiative]. 2020. *Elevating Mountains in the post-2020 Global Biodiversity Framework 2.0*. Policy Brief. Available at: https://www.grida.no/publications/473; accessed on 6 July 2020.