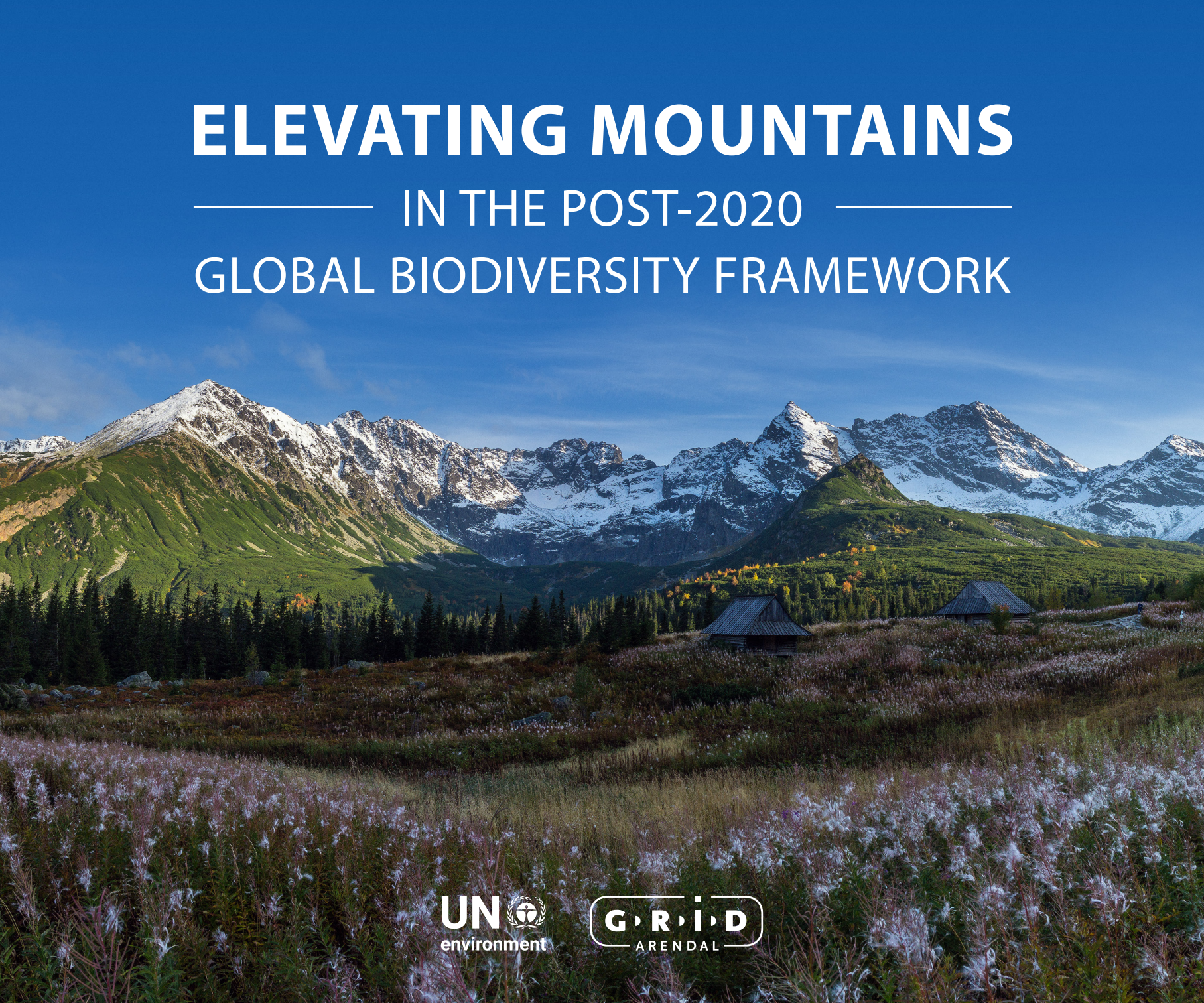
ELEVATING MOUNTAINS

IN THE POST-2020 GLOBAL BIODIVERSITY FRAMEWORK



UN environment

GRID ARENDAL

Introduction

Mountains are home to all of the world's principal biome types and support a wide variety of ecosystems. Many of these ecosystems have a higher richness of species and levels of endemism than adjacent lowlands, providing refuge to threatened animal and plant species.

Mountain environments are found in every continent and comprise roughly one quarter of the world's land surface,[1] with 25 of 34 biodiversity hotspots located entirely or partly in these areas. Around 1.15 billion people live in mountainous areas worldwide,[2] which also provide livelihoods for many millions living downstream.

Given the vital importance of mountain ecosystems for the world's population and of maintaining the world's biological diversity, particularly in the tropics and warmer temperate latitudes, mountains should be given high priority in the post-2020 global biodiversity framework and mainstreamed throughout.

Citation: UNEP & GRID-Arendal (2019). *Elevating Mountains in the post-2020 Global Biodiversity Framework.*

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Current inclusion of mountains in the biodiversity and sustainable development agenda

Mountains are specifically mentioned in article 20, paragraph 7 of the Convention on Biological Diversity (CBD), which states that with regard to funding and transfer of technology, developed country Parties shall take into consideration *"the special situation of developing countries, including those that are most environmentally vulnerable, such as those with arid and semi-arid zones, coastal and mountainous areas."* In 2004, the Conference of the Parties (COP) adopted the Programme of Work on Mountain Biological Diversity as per decision VII/27, though it lacked specific targets or indicators for mountain biodiversity. In addition, no specific reference was made to mountains in the CBD Strategic Plan for Biodiversity 2011–2020, indicating that there is a clear need for mountainous areas to be included in the post-2020 outcome document, and for specific mountain targets or indicators to be considered.

At present, mountains are included in the Sustainable Development Goals (SDGs) as outlined in Table 1. Many of the Aichi Biodiversity Targets are also relevant for mountains, yet they are only explicitly mentioned in two indicators for target 14 under Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services, which mirror SDG indicators 15.4.1 and 15.4.2.

Table 1. Specific targets and indicators covering mountains within the Sustainable Development Goals and Aichi Biodiversity Targets (2011–2020)

Sustainable Development Goal	Targets and indicators
SDG 6. Ensure availability and sustainable management of water and sanitation for all	**6.6.** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
SDG 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	**15.1.** By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
	15.4. By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development **15.4.1.** Coverage by protected areas of important sites for mountain biodiversity **15.4.2.** Mountain Green Cover Index
Aichi Biodiversity Target	**Indicators**
Target 14. By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable	• Coverage by protected areas of important sites for mountain biodiversity • Mountain Green Cover Index.

Key facts and figures on mountain biodiversity, including current challenges and opportunities


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Protected areas

Mountains have intrinsic biodiversity value and perform important functions for ecosystems, communities and climate regulation. Protected areas are crucial for conserving mountain biodiversity and ensuring their sustainable use. Protected areas covering mountainous sites of particular importance in terms of biodiversity (known as Key Biodiversity Areas – KBAs)[3] are increasing at an average annual rate of 0.6 per cent worldwide. However, this is not evenly distributed across continents, as mountain regions in North America and Europe have a much higher rate of coverage (68 per cent) than those in West Asia and North Africa (18.4 per cent).

Endemic mountain species

Many mountain ecosystems have an extraordinary richness of species. Endemism levels are often high, particularly for mid-altitude mountain regions, both in warmer temperate zones and in the tropics. Lower-lying mountains also support unique biodiversity due to the compression of a wide variety of ecosystems across a short altitudinal gradient from base to summit. Many mountain regions are facing and experiencing profound change as a result of human development, climate change and other stressors, which is leading biodiversity loss to become a serious issue. Some mountain ecosystems have been observed as responding quickly to accelerated warming with increased plant diversity,[4] which poses a threat, through competition, to many specialised mountain species and may lead to their extinction. Many endemic mountain species, including well-known species such as the snow leopard, mountain tiger and mountain gorilla, face an uncertain future based on the result of these stressors.

Ecosystem services

Mountain communities and people living in the lowlands are highly dependent on ecosystem services that mountain environments provide, including food, water, medicines and protection

from soil degradation and other hazards.[5] It is estimated, for example, that mountains provide fresh water to more than half of the world's population.[6] However, climate change and other stressors pose a serious threat to the availability and sustainability of these ecosystem services. For example, the rapid retreat of glaciers and changes in snow cover will significantly impact water availability for ecosystems, affecting people within and far beyond mountain boundaries.

Mountains around the world have a high level of cultural diversity, as they are home to many indigenous peoples and local communities who are important stewards of their environment. These regions have been the source of many major modern crops (including maize, potatoes, barley, beans and apples) and animals (sheep, goats, yaks, llama and alpaca) and continue to host a high genetic diversity of traditional crops and livestock. However, the ongoing modernization of agricultural production is increasingly threatening this diversity, as it is resulting in the use of fewer and less genetically diverse varieties.


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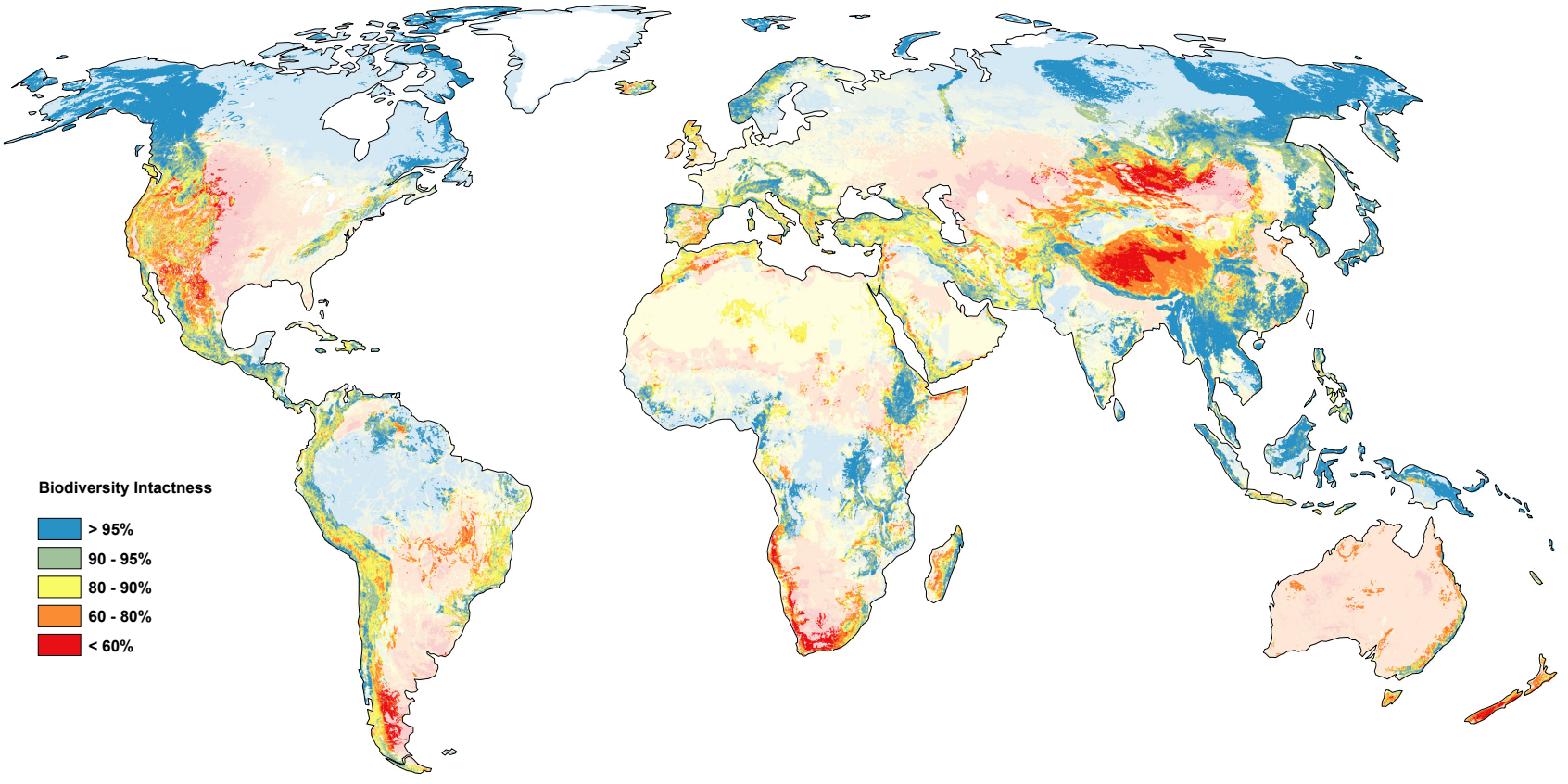
Climate change adaptation and mitigation
Temperatures at higher altitudes are rising faster than the global average, which combined with precipitation changes, is severely impacting mountain biodiversity and ecosystems. The survival of many species and ecosystems depend on their ability to migrate or adapt to these changes. Mountain species with limited habitat tolerance, particularly at higher elevations, and those with low dispersal capacity are most at risk from the adverse effects of climate change, which also affect mountain communities that depend on these ecosystems.

Ecosystem-based adaptation is a cost-effective solution for mountain regions that provides multiple benefits for both communities and biodiversity, through the conservation,

Biodiversity intactness in mountainous areas



This map shows biodiversity intactness of ecological assemblages in terms of total abundance of species occurring in primary vegetation, in mountain areas worldwide.

The Biodiversity Intactness Index (BII) shows the average abundance of a large, taxonomically and ecologically diverse set of naturally occurring species in a terrestrial area, relative to a baseline with minimal human impacts. The global data set (Newbold et al. 2016) used in this map was derived by combining local estimates of biodiversity (from the Projecting Responses of Ecological Diversity in Changing Terrestrial Systems (PREDICTs) project) with fine-scale (1 km) land-use information. The BII ranges from 100 per cent, representing pristine assemblages, to 0 per cent, representing wholly destroyed or replaced assemblages. A safe limit of 90 per cent has been proposed by the planetary boundaries framework (Steffen et al. 2015), arguing that levels below 90 per cent may result in large-scale disruption and risk the provision of ecosystem services. To define mountain areas, the K3 characterization (Karagulle et al. 2017) is used. It includes four classes of mountains: high, scattered high, low and scattered low, using three classification parameters: slope, relative relief and profile. Non-mountain areas have been shaded out.

Sources: Newbold, T., Hudson, L.N., Arnell, A.P., Contu, S. et al. (2016). Dataset: Global map of the Biodiversity Intactness Index; Karagulle, D., Frye, C., Sayre, R., Breyer, S., Aniello, P., Vaughan, R. and Wright, D. (2017). Modeling global Hammond landform regions from 250-m elevation data. Transactions in GIS. https://doi.org/10.1111/tgis.12265; Biodiversity Indicators Partnership (2019). Biodiversity Intactness Index. https://www.bipindicators.net/indicators/biodiversity-intactness-index. Accessed 7 August 2019; Steffen, W., Richardson, K., Rockström, J., Cornell, S.E. et al. (2015). Planetary boundaries: Guiding human development on a changing planet. Science 347(6223).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sustainable management and restoration of ecosystems to ensure that they remain healthy in the face of climate impacts. Such an approach can draw from the wealth of traditional knowledge of mountain peoples to help ecosystems continue providing benefits, such as firewood, clean water and food, while also creating physical barriers to climate hazards.


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Disaster risk reduction

Although mountains are generally hazardous places and vulnerable to natural disasters, including avalanches, landslides, droughts and floods (which may also reach downstream areas), maintaining biodiversity in mountain ecosystems is important as it increases the resilience of these ecosystems and helps reduce the risk of such disasters and provides protection against them. Mountain forests are particularly valuable for protection against natural hazards and act as a physical barrier to prevent landslides, rock falls and avalanches. Forest roots also stabilize soil, prevent erosion and reduce the risk of floods.

1. The exact area of the global land surface covered by mountains depends on the definition used. Sayre et al. (2018) outline existing definitions of mountains, K1, K2 and K3. K1 and K3 definitions rely on high-resolution imagery and result in mountains (excluding Antarctica) occupying 24.3 per cent and 30.5 per cent of global land area respectively.
2. This figure is calculated by applying the definition of mountains regions of Kapos et al. (2000) to the 2015 United Nations adjusted Gridded Population of the World version 4 (GPWv4). Geographic information systems (GIS) software is used to derive mountain population estimates.
3. Key Biodiversity Areas (KBAs) are a set of internationally agreed upon sites around the world that meet one or more of 11 criteria.
4. Steinbauer, M.J., Grytnes, J.-A., Jurasinski, J., Kulonen, A., Lenoir, J., Pauli, H., et al. (2018). Accelerated increase in plant species richness on mountain summits is linked to warming. Nature 556, pp. 231–234.
5. Martín-López, B., Leister, I., Cruz, P.L., Palomo, I., Grêt-Regamey, A., Harrison, P.A., et al. (2019). Nature's contributions to people in mountains: A review. PLoS ONE 14(6), e0217847.
6. Egan, P.A. & Price, M.F. (2017). Mountain Ecosystem Services and Climate Change: A Global Overview of Potential Threats and Strategies for Adaptation. United Nations Educational, Scientific and Cultural Organization, Paris, 33pp.

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Convention on Biological Diversity

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