

Defining mountain regions



Geographers have produced numerous definitions aiming to distinguish mountain environments from non-mountains; many build on common perceptions of what constitutes a mountain, and none is fully quantitative. With the support of the Swiss Development Corporation, UNEP-WCMC used criteria based on altitude and slope in combination in order to represent the environmental gradients that are key components of mountain environments (Kapos *et al.* 2000).

Topographical data from the GTOPO30 global digital elevation model (USGS EROS Data Centre 1996) were used to generate slope and local elevation range on a 30 arc-second grid of the world. These parameters were combined with elevation to arrive at the empirically derived definitions of six mountain classes. To reduce projection distortion in the original dataset, analysis was based on continental subsets in equidistant conic projection.

Class

- 1 elevation > 4 500 m
- 2 elevation 3 500 – 4 500 m
- 3 elevation 2 500 – 3 500 m
- 4 elevation 1 500 – 2 500 m and slope $\pm 2^\circ$
- 5 elevation 1 000 – 1 500 m and slope $\pm 5^\circ$ or local elevation range (7 km radius) > 300 m
- 6 elevation 300 – 1 000 m and local elevation range (7 km radius) > 300 m
- 7 isolated inner basins and plateaus less than 25 km² in extent that are surrounded by mountains but do not themselves meet criteria 1-6

The seventh class was introduced in the 2002 revision of the original 2000 system. The global mountain area thus defined is almost 40 million km², or some 27 per cent of the Earth's surface. If all Class 7 areas are excluded, the total area classified as mountainous falls to 39.3 million km², and the area of non-mountain land increases to 107.6 million km².

Antarctica has been excluded from the statistics presented in this report; this reduces the proportion of land area classified as mountainous to around 24 per cent. Future work will try to incorporate bioclimatic data into this formal topographic definition in order to model regional and latitudinal variations in the transition to mountain conditions.

Another study (Meybeck *et al.*, 2001) used the same digital elevation model and a combination of 'relief roughness' and elevation to partition the entire land surface into 15 classes of relief typology. In this system, Tibet and the Altiplano are classed as 'very high plateau' rather than mountains, and the global mountain area is calculated as 33.5 million km².

Networks and resources

MOUNTAIN NETWORKS

Mountain Forum

<http://www.mtnforum.org/index.html>

Asia Pacific Mountain Network

<http://www.mtnforum.org/apmn/index.html>

CONDESAN: Consorcio para el Desarrollo Sostenible de la Ecorregión Andina

<http://www.condesan.org/>

MOUNTAIN LIVELIHOODS

Sustainable Livelihoods and Poverty Alleviation. Background paper and discussion for the Bishkek Global Mountain Summit

<http://www.mtnforum.org/bgms/paperb2.htm>

International Conference on Sustainable Agriculture and Rural Development in Mountain Regions (SARD) 16-20 June 2002, Adelboden, Switzerland

<http://www.iisd.ca/linkages/sd/mountains/sard/>

Hunger and food insecurity. An introduction for the International Year of Mountains

<http://www.mountains2002.org/i-hunger.html>

High stakes: The future of mountain societies. Panos report

http://www.panos.org.uk/environment/high_stakes_mountain_societies.htm

Sustainable rural development and food security: the role of mountain development in Africa.

Twenty-second FAO regional conference for Africa, Cairo, Egypt, 4-8 February 2002

<http://www.fao.org/DOCREP/MEETING/004/Y6056E.HTM>

Sustainable Development In Mountain Areas in Latin America and the Caribbean.

Twenty-sixth FAO regional conference for Latin America and the Caribbean, Merida, Mexico, 10-14 April 2000

<http://www.fao.org/docrep/meeting/x4442e.htm>

ENERGY, TRANSPORT AND WATER

Mountains of the World: Mountains, Energy, and Transport

<http://www.mtnforum.org/resources/orders/energy.htm>

Mountain Waters. An introduction for the International Year of Mountains

<http://www.mountains2002.org/i-water.html>

BIODIVERSITY

Mountain biodiversity.

An introduction for the International Year of Mountains

<http://www.mountains2002.org/i-bio.html>

Mountains and Mountain Forests. UNEP-WCMC maps of mountains and mountain forests of the world

<http://www.unep-wcmc.org/habitats/mountains/index.html>

Mountain forests. An introduction for the International Year of Mountains

<http://www.mountains2002.org/i-forests.html>

Mountain People, Forests, and Trees: Strategies for Balancing Local Management and Outside Interests. Synthesis of an electronic conference, 1999

http://www.mtnforum.org/resources/library/mpft_01.htm

Cloud Forests

<http://www.unep-wcmc.org/forest/cloudforest/english/homepage.htm>

Mountain biodiversity at risk. Review of mountain biodiversity and agrobiodiversity

http://www.idrc.ca/Media/MountainBio_e.html

Biodiversity in the Hindu Kush, Himalayas. ICIMOD articles and information resources

http://www.icimod.org.sg/focus/biodiversity/biodiv_toc.htm

First global conference on mountain biodiversity, Rigi, Switzerland, Sept. 2000

<http://www.unibas.ch/gmba/rigi.html#Anchor-Conference-35326>

GRASP - Conservation of Mountain Gorillas and their Afromontane Forest Habitat

<http://www.unep.org/grasp/supportmountaingorillas.asp>

TOURISM

Mountain tourism. An introduction for the International Year of Mountains

<http://www.mountains2002.org/i-tourism.html>

Community-Based Mountain Tourism: Practices for Linking Conservation with Enterprise

http://www.mtnforum.org/resources/library/cbmt_01.htm

Mountains of the World: tourism and sustainable mountain development. Report produced by Mountain Agenda

<http://www.mtnforum.org/resources/library/magen99a.htm>

CONFLICT

Conflict in mountain regions. An introduction for the International Year of Mountains

<http://www.mountains2002.org/i-conflict.html>

CLIMATE CHANGE

Climate change and mountains.
An introduction for the
International Year of Mountains
<http://www.mountains2002.org/i-climate.html>

Glacial Lakes and Glacial Lake
Outburst Floods
<http://www.icimod.org.sg/publications/profiles/glacial.htm>

Kilimanjaro's melting cap
<http://www.peopleandplanet.net/doc.php?id=972>

Australia's declining alpine regions
<http://www.peopleandplanet.net/doc.php?id=1055>

CASE STUDIES, BEST PRACTICES

Mountain People, Forests, and
Trees: Strategies for Balancing
Local Management and Outside
Interests. Synthesis of an electronic
conference, 1999
http://www.mtnforum.org/resources/library/mpft_01.htm

Mountain Laws and Peoples:
Moving Towards Sustainable
Development and Recognition of
Community-Based Property Rights.
Synthesis of an electronic
conference, 1998
http://www.mtnforum.org/resources/library/mlp_01.htm

Community-Based Mountain
Tourism: Practices for Linking
Conservation with Enterprise.
Synthesis of an electronic
conference, 1998
http://www.mtnforum.org/resources/library/cbmt_01.htm

Mountains of the World: tourism and
sustainable mountain development.
A review and case studies of the
issues involved in sustainable
mountain tourism
<http://www.mtnforum.org/resources/library/magen99a.htm>

Moving Mountains. A special edition
of the UNASYLVA forestry magazine
of FAO
<http://www.fao.org/docrep/w9300e/w9300e00.htm#Contents>

People & the Planet. A special issue
of the magazine on mountains
<http://www.peopleandplanet.net/doc.php?id=966§ion=11>

STATE OF THE ENVIRONMENT

GMBA: Global Mountain Biodiversity
Assessment
<http://www.unibas.ch/gmba/index.html>

Global Change and Mountain
Regions. The Mountain Research
Initiative of IGBP, IHDP, GTOS and
UNESCO MAB
<http://www.mri.unibe.ch/>

Our Planet. UNEP's magazine for
environmentally sustainable
development, special issue on
mountains and ecotourism
<http://www.ourplanet.com>

POLICIES AND CONVENTIONS

UN Division of Sustainable
Development
The text of Chapter 13, Agenda 21 –
managing fragile ecosystems:
sustainable mountain development
<http://www.un.org/esa/sustdev/agenda21chapter13.htm>

Sustainable mountain development.
The state of implementation of
Chapter 23 of Agenda 21, on
sustainable mountain development
<http://www.un.org/documents/ecosoc/cn17/2000/ecn172000-6add3.htm>

European Mountain Initiative
<http://www.unep.ch/roe/emi.htm#top>

The Alpine Convention
<http://gridk1ach.grid.unep.ch/preAC/en/convalp.htm>

INSTITUTIONS, PROGRAMMES

FAO Mountain Programme
<http://www.fao.org/forestry/foda/infonote/en/t-smd-e.stm>

The Mountain Institute
<http://www.mountain.org/index.html>

GEF: Global Environment Facility
Operational Programme No 4
(Mountains)
http://gefweb.org/Operational_Policies/Operational_Programs/OP_4_English.pdf

UNU Project on Sustainable
Mountain Development
<http://www.unu.edu/env/mountains/index.htm>

International Centre for Integrated
Mountain Development (ICIMOD)
<http://www.icimod.org.sg/>

Mountain Research and
Development. The primary journal
for mountain research
<http://www.mrd-journal.org/>

UNESCO in the Mountains of the
World. An overview of the principal
UNESCO programmes operating in
mountain regions
<http://valhalla.unep-wcmc.org/unesco/index.htm>

Banff Centre for Mountain Culture
<http://www.banffcentre.ab.ca/cmcc/>

CIPRA: Commission Internationale
pour la Protection des Alpes
<http://www.cipra.org/>

This selection of resources was
compiled for the UNEP web portal
on mountains:
<http://mountains.unep.net>

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Mountains of the World: Tourism and Sustainable Mountain Development.
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Mountains of the World: Mountain Forests and Sustainable Development.
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Mountains of the World: Mountains, Energy and Transport.
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Intergovernmental Panel on Climate Change, Task Group on Scenarios for Climate Impact Assessment.
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Paragraph 40

«Mountain ecosystems support particular livelihoods, and include significant watershed resources, biological diversity and unique flora and fauna. Many are particularly fragile and vulnerable to the adverse effects of climate change and need specific protection. Actions at all levels are required to:

- a develop and promote programmes, policies and approaches that integrate environmental, economic and social components of sustainable mountain development and strengthen international cooperation for its positive impacts on poverty eradication programmes, especially in developing countries;
- b implement programmes to address, where appropriate, deforestation, erosion, land degradation, loss of biodiversity, disruption of water flows and retreat of glaciers;
- c develop and implement, where appropriate, gender-sensitive policies and programmes, including public and private investments that help eliminate inequities facing mountain communities;
- d implement programmes to promote diversification and traditional mountain economies, sustainable livelihoods and small-scale production systems, including specific training programmes and better access to national and international markets, communications and transport planning, taking into account the particular sensitivity of mountains;
- e promote full participation and involvement of mountain communities in decisions that affect them and integrate indigenous knowledge, heritage and values in all development initiatives;
- f mobilize national and international support for applied research and capacity-building, provide financial and technical assistance for the effective implementation of sustainable development of mountain ecosystems in developing countries and countries with economies in transition, and address the poverty among people living in mountains through concrete plans, projects and programmes, with sufficient support from all stakeholders, taking into account the spirit of the International Year of Mountains 2002. »

Full text available at: www.johannesburgsummit.org