Global Report

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Sustainable Mountain Development
Green Economy and Institutions

From Rio 1992 to Rio 2012 and beyond

2012

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Mountain Partnership

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Key policy messages

The need for action

Mountains provide vital goods and services for the benefit of all humankind, for supporting sustainable development at the global level, and for moving the world towards a greener economy. Twenty years after Rio, the challenge of sustaining the provision of these goods and services has never been greater. The global community must act – a new agenda and strengthened institutional framework for mountain development is urgently required.

Guiding principles

This new mountain agenda should be based on the following policy principles:

- **Mountain-specific strategies:** Mountains hold specific challenges and opportunities for global sustainable development relating to green economy and institutions. Targeted strategies are thus required for effective action, especially at the national level. Global and regional institutions, conventions, and frameworks such as the UN Framework Convention on Climate Change, the UN Convention on Biological Diversity, and the UN Convention to Combat Desertification need to include specific programmes for mountain regions.

- **Transboundary cooperation, upstream–downstream linkages, and rural-urban linkages:** Many mountain ecosystems and the services they provide transcend national borders, with the majority of benefits accruing to lowland regions. Strengthening transboundary and upstream–downstream collaboration will increase the effectiveness of interventions. Increasing economic interdependencies between rural and urban areas within mountains, as well as between mountains and lowland cities and metropolitan regions also provide opportunities for partnership and collaboration.

- **Governance and institutions:** Agenda 21 as a key reference for future action requires the involvement of all relevant stakeholders. Specifically, mountain populations must be involved in all decision-making stages from planning to implementation.

- **Compensation for ecosystem goods and services:** Ensuring that mountain populations receive full compensation for the provision of ecosystem goods and services will enhance local livelihoods, reduce poverty, and ensure a sustained flow of these goods and services for the benefit of all.

- **Balance conservation and development:** Mountain ecosystems are often fragile, and their integrity is important. But mountain regions frequently also lag behind in development for reasons beyond their control. Balancing conservation and development is thus important; sound local and regional knowledge and targeted investment can help achieve this aim.

- **Coherence with principles of international cooperation:** Collective action in support of mountains must be consistent with existing and evolving principles and norms of international cooperation. These include, inter alia, the principle of common but differentiated responsibility, intra- and intergenerational equity, the precautionary principle, duty to prevent transboundary harm, human rights of women, men, and children, and protection of traditional knowledge.


S. Nepal

Policy action

1. **Sustainable Mountain Development Goals:** Specific strategies are required for effective policy action, including investments in green economy and institutions. We invite countries and regional bodies to design specific Sustainable Mountain Development Goals (SMDGs) within the framework of national SDGs, indicating priority objectives and implementation plans which include green investment and institutional development.

2. **Water resources management:** Given the key role of mountains in providing water for domestic and commercial use, food security, and green energy, we invite countries and regional bodies to develop integrated water resource management strategies. These strategies should be based on a multidisciplinary approach, which embeds sectoral policies and action within the overall goal of sustainable development; combines top-down and bottom-up approaches; and secures long-term planning and financing, capacity development, and institution building.

3. **Green investment:** Mountain regions have a high potential for greening economies within and beyond mountains. In order to make full use of this potential, countries are invited to tap existing international finance mechanisms, to explore partnerships with the private sector, and to prepare green investment plans for mountain regions. Priority areas include green energy with a focus on sustainable hydropower generation; responsible mining and resource extraction; and promotion of small and medium-sized industry, tourism, agriculture, and biodiversity.

4. **Disaster risk management:** Mountains are particularly vulnerable to the effects of natural disasters, with consequences far beyond mountain regions. We therefore invite countries to prepare mountain-specific disaster risk management plans, which integrate risk assessment, prevention, response, and recovery. These plans could contain elements of a green economy such as sustainable forestry. They should also help revive or establish institutions capable of successfully dealing with hazards and risk management.
5. **Regional centers of competence:** Lack of mountain-specific knowledge hinders informed policy making and effective action at all levels of decision-making. Technologies and institutions that work well in lowland areas are often ill-adapted to mountain realities. There is thus a need to promote regional centers of competence to advance research and green technology development, capacity and institution building for green development, and policy advice tailored to mountain areas.

Mountains, green economy, and institutions for global sustainable development

This report

- presents the key role that mountain societies and resources play in the global green economy. It illustrates the manifold opportunities that mountain regions present for such an economy at global, regional, national and local levels.
- highlights the importance and diversity of appropriate, well-conceived, and effective institutions for promoting sustainable development in mountain regions. Examples cover the entire institutional and geographical range from global to local.

A global green economy depends on mountain regions and on institutions that support sustainable mountain development

Mountains are crucial for a global green economy. Providing 60–80% of the world's freshwater resources for domestic, agricultural, and industrial consumption, mountains are a critical driver of food security and clean energy. Mountains also supply important minerals and genetic resources for major food crops; indeed, mountain farming is inherently green thanks to its small scale character and low carbon footprint. Home to 17 of the 34 recognized global biodiversity hotspots, mountains play a pivotal role in conserving and harnessing biological diversity for a green economy. One third of all protected areas are in mountainous watersheds that secure water supplies for many of the world's largest cities. Because mountains are among the regions most sensitive to climate change, they act as early warning systems.

Finally, mountains attract, nourish, and contribute to the human and social capital required to transition to a green economy worldwide. All of the above represent critical assets for a world that is committed to a green economy and sustainable development.

Since the 1992 United Nations Conference on Environment and Development, an impressive set of institutions and organizations have drawn attention to the unique position of mountain regions. At the global level, Chapter 13 of Agenda 21, numerous UN resolutions, the creation of the International Mountain Partnership, and international conventions have helped mountains secure a permanent place on political agendas.

As a result, the range of actors engaged in mountain development and research has broadened significantly; while many established institutions have renewed interest in mountains, numerous new institutions are focusing on mountains to mobilize resources. From regional to local levels, mountain institutions as diverse as international treaties, networks of non-governmental organisations, municipalities, and researchers, farmer cooperatives, resource user groups, and tourism operators have consistently demonstrated a commitment to sustainable mountain development.

During the last twenty years, experiences gained in mountain regions have highlighted their multidimensional character. Awareness of the importance of integrated approaches thus increasingly complements still dominating sectoral approaches to pressing societal concerns. For these reasons, nurturing institutions for sustainable development must remain a global priority.

PART 1

Mountains and green economy


M. Price

Why mountains matter for a green economy and global sustainable development

Covering about one quarter of the Earth's land surface, mountains provide basic services and goods for all humankind, such as water and biodiversity. Mountains are also sensitive ecosystems that act as early indicators of climate change, e.g. through rapid glacier melting with consequences far beyond mountain regions. The Food and Agriculture Organization of the United Nations (FAO) found that some 40% of the 720 million people living in mountains are vulnerable to food insecurity; of these, half are chronically hungry. Caloric needs are greater at higher altitudes, yet growing seasons are shorter. Nor can most of these 250 million vulnerable mountain people migrate: overcrowded lowlands cannot absorb them. Extractive industries such as mining and timber, and massive hydropower projects often damage ecosystems and drain resources from mountains while providing few benefits to upland dwellers. Few poor mountain families have access to any of the social services enjoyed by even the poorest of lowlanders: health clinics, elementary schools, and connections to markets. Without the stewardship of natural resources provided by these mountain communities, both they and the billions of downstream users who depend on mountain resources cannot achieve sustainability.

The coincidence of high priority conservation areas and abject poverty should have led development organizations to target these areas long ago. Sadly, this has not yet happened. If our world – with growing population and increasing pressure from global change and economic scale – intends to move towards more sustainable development and a greener economy, it will even more depend on the sustainability of mountain goods and services. Such sustainability in turn means that greening mountain economies and addressing mountain poverty must be addressed as an urgent and important priority.

With regard to global green development, mountain water is of paramount importance – for drinking and green energy generation in the form of hydropower, but also for irrigation for improved food security. Sustainable management of mountain watersheds in order to maintain reliable water supplies is thus crucial. Management can be improved by innovative mechanisms such as payments for environmental services (PES), which compensate mountain land users for stewardship that benefits those downstream. If designed properly, such payments schemes can have a tangible effect on local incomes in mountain areas. The same is true for specific, high quality mountain products produced for lowland urban markets, and other approaches that connect upstream and downstream populations. This report presents successful initiatives from mountain areas around the world, which have a remarkable potential for upscaling, and which could help direct the world towards a greener and more sustainable path of development.

Green economy

According to the definition proposed by the United Nations Environment Programme, a green economy is one where economic growth is accompanied by reduced carbon emissions and pollution, enhanced energy and resource efficiency, and maintained ecosystem services including biodiversity. Such an economy could address important global economic and development issues. These are support of economic growth while decoupling it from increasing use of natural resources; mitigation of and adaptation to climate change; creation of employment, promotion of the Millennium Development Goals, and poverty eradication.

The green economy concept is not uncontested. One reason for this is the fact that the development agendas of industrialized, transition, and developing countries differ considerably. Industrialized countries are mainly concerned with overcoming the economic crisis, creating jobs, and addressing climate change. Transition countries have increased investment in energy-efficient economies, but their growth targets may outweigh these efforts. Green economy in developing countries is mainly linked to poverty, social security, and food security. Achieving a global green economy will require harmonizing these agendas, and the concept itself. Relating to mountain development, contextualizing action will be important: mountain specificities such as particular resource endowments and services and their vulnerability must be taken into account, as well as national policy priorities and regional frameworks of collaboration.

Source: NCCR Policy Brief No.6 January 2012

Legacies of the past: Environmental change and its drivers in the 20th century

human population	grew 4 fold
irrigated land	grew 5 fold
energy use	grew 13 fold
CO2 emission	grew 17 fold
industrial production	grew 40 fold

"Nothing like this has ever happened in human history. The mere fact of such growth, and its unevenness among societies, made for profound disruptions in both environment and society"

Source: McNeill J.: Modern Global Environmental History. A turbulent and dramatic scenario. UPDATE of IHDP 02:1-3

A global green economy depends on mountain waters

Water for half of humankind

Mountains are the water towers of the world. Thanks to higher rainfall and lower evaporation, they provide more water per unit area than lowlands. Mountains provide freshwater to half of the world's population for irrigation and food production, industry, domestic use and hydropower. In many parts of the world, mountain waters contribute from 40% to over 90% of river flow in their respective basins

Mountain waters are critically important on every continent. In South Asia, Southeast Asia, and southern China, about 1.3 billion people or close to 20% of the global population depend on water from the Himalaya, Karakoram, and Tien Shan massifs and from Tibet. Also the Rocky Mountains, the Andes, the mountains of the Middle East, the Atlas Mountains, the mountains around the Mediterranean, and the mountains of Eastern and Southern Africa play a key role in regional and lowland water supplies, providing as much as 60-100% of total supplies.

The importance of mountain waters is shown by the scale of past and present water infrastructure, for example by long-distance water conveyance systems, both intra- and interbasin, for general development including agriculture. California is a case in point. Interventions in the water sector in this state since the late 19th century have been so massive that California has been called the most hydrologically altered landmass on the planet. On the other side of the Pacific, China has a huge project underway for the transfer of water from the water-rich, mountainous part in the west to the dryer east of the country including Beijing, the country's capital. India has its own plans for massive transfers of water from the Himalaya in the north to the dryer southern part of the country. In all these cases, a green economy will depend on such water transfers; the challenge will be to plan, execute, and manage them sustainably. Mountain waters are also important for domestic and industrial use in more humid zones such as the eastern United States or middle Europe, at least for the dryer and warmer seasons of the year.

Mountain waters: high on the global agenda

The importance of mountains as headwaters and sources of water for the often densely populated surrounding lowlands has moved up on political agendas. In 2008, the United Nations (UN) General Assembly adopt Resolution 62/196 on Sustainable Mountain Development, stating that "The UN General Assembly notes with appreciation that a growing network of governments, organizations, major groups and individuals around the world recognizes the importance of the sustainable development of mountain regions for poverty eradication, and recognizes the global importance of mountains as the source of most of the Earth's freshwater..."

Mountain waters for global food security and poverty alleviation

Global food security and poverty alleviation, let alone eradication, will not be achieved without an adequate flow of mountain water. Many highly productive lowland agricultural regions that are key to providing food for their large populations critically depend on mountain waters for at least part of their growing seasons. In most of the dryer lowland areas, where irrigation is needed, this dependency reaches between 75 and 100% of water needs.

Numerous examples can be found on all continents (Figure 1), including industrialized and developing economies. In Africa, Egypt depends almost completely on the waters of the Nile when it comes to domestic food production. The country's 81 million people live on 1% of the area in close proximity to the river. Close to 100% of the Nile water in Egypt comes from the mountains of Ethiopia and around the Victoria Basin. Egypt has been called a gift of the Nile – it could be called a gift of mountain waters. The same is true for California: close to 100% of the waters of the Colorado River originate in the Rocky Mountains. The river is the principal water resource for California (and six other states in the US), which is not only the eighth-largest economy in the world, but also one of its leading agricultural and food producer.

The countries of Central Asia – Tajikistan, Kyrgyzstan, Turkmenistan, and Uzbekistan – with a population of around 50 million depend entirely on waters from

the Tien Shan and Pamir mountains for their water supply, economic development, and largely irrigated food production. The Indus Basin in Pakistan, one of the largest irrigated areas in the world, ensures the food supply for the country's more than 180 million people, most of them living in the lowlands, and generates 23% of its gross domestic product (GDP). 80% of the waters that feed the irrigation system come from the Hindu-Kush-Himalaya. Northwestern India relies on the waters of the Ganges for irrigation and food security. Southwestern China, which has the largest mountain population in the world, also depends to a large extent on the waters of the Hindu Kush-Himalaya for food production, industry, and hydropower. In Africa, single mountains such as Kilimanjaro or Mount Kenya provide water for millions of people in surrounding areas. Finally, throughout the Andes, populations concentrated in coastal areas depend entirely on water from the mountains for their food production.

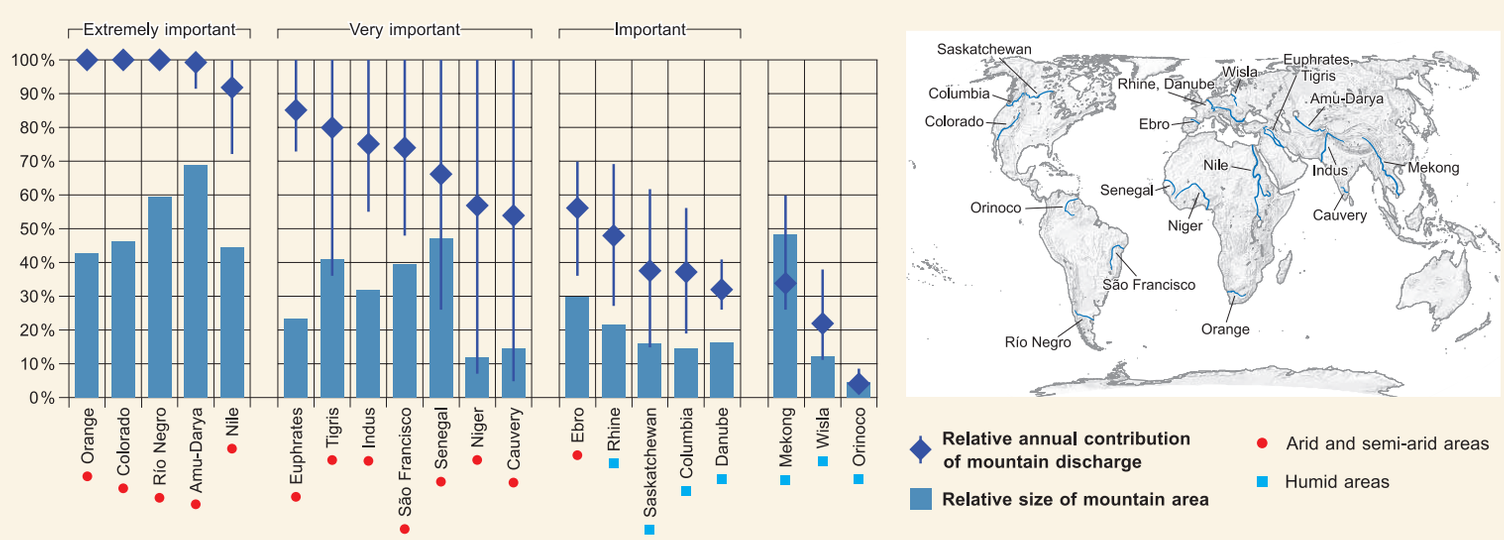
Mountain water for an increasingly urbanized world

Today, just over half of the global population lives in urbanized areas – a proportion that will continue to increase. Many of these urban areas critically depend on mountain waters for much of their freshwater supplies. This is especially true for the millions of people living in towns along the eastern and western coasts of the Pacific Ocean, in the foothills of the Alps, and along the Mediterranean coast. Many of the world's largest cities on all continents critically depend on mountain waters: Rio de Janeiro, New York, Jakarta, Tokyo, Delhi, Los Angeles, Barcelona, Nairobi, Addis Abeba, Melbourne, Bogotá, Lima, La Paz, Quito, and Mexico City. Sustainable development that aims to eradicate poverty, provide green jobs, and increase wellbeing for all those living in these urban areas is simply not possible without a reliable supply of fresh water from mountain areas.

The challenges of more efficient water use

Pressure on water resources for irrigation and food production, industrialization, hydropower generation, and urbanization is increasing caused by economic development and population growth. The added pressure from effects of climate change will be greatest in semi-arid regions and in the monsoon belts, especially during seasonal deficits previously mitigated by water supplies from mountains. These changes will give new impetus to the construction of dams and water transfer systems. India and China, for example, are planning or already implementing vast inter-basin schemes to transfer water to water-scarce regions, the effects of which are difficult to anticipate. If these schemes are realized, more than two billion people will depend on water originating in the Himalayas.

Historically, pressure on water resources has never decreased. Current trends in water availability and requirements, however, render an imminent decrease possible. This limits the prospects of supply enhancement. In a world of growing water scarcity it is urgent to improve our knowledge of



Contribution of mountain area to total river discharge, and size of mountain area as compared to total basin area, for selected rivers worldwide (Viviroli et al 2003)

present and future mountain water resources and freshwater supplies. This necessitates investment in long-term high-altitude observatories, especially in the developing world, where their number is much lower than what is recommended by the World Meteorological Organization; the current trend of closing down monitoring networks to save operating costs must thus be reversed. While monitoring is essential, it is not enough. Public access to data on water resources, where it exists, must be improved; and current restrictions imposed for strategic reasons must be reconsidered. Investment in infrastructure, technology, and international collaboration, as well as a shift in water management from the supply side to the demand side, will be necessary to sustainably manage and equitably share future water supplies from mountain areas.

Greening the energy sector

Hydropower – the technically most mature form of green energy

Mountains have a key role to play in greening the world's energy sector by providing renewable energy – especially in the form of hydropower, but also solar and wind power, and power from biogas. Hydropower provides 21% of all electricity worldwide and is the most advanced form of green energy, representing 87% of green energy at present. While industrialized countries have harnessed most of their potential, developing countries have significant potential for further development. The situation in mountain countries – here taken as countries with over 50% of their land in mountain areas – highlight this exploitation gap. Industrialized countries like Norway and Japan have developed close to 90% of their potential; China as a transition country has developed over 30%; developing countries such as Ethiopia, Nepal, and Bhutan between 2% and 7%, and Tajikistan and Kyrgyzstan less than 10%.

With their relative abundance in water resources, mountain regions will play an increasingly important role in hydropower generation for boosting the production of green energy for users at local, national, and regional levels. This future has already begun, especially in transition and developing countries. Endowed with the largest potential worldwide, China is prioritizing hydropower in its new energy agenda and aims to almost triple its capacity from 110,000 megawatt (MW) in 2005 to 300,000 MW in 2020. This will result in a massive West-East and highland-lowland energy transfer, since more than two thirds of the water power resources are located in the mountains and uplands of the western part of the country – Tibet, Yunnan, and Sichuan – while the users are found in the densely populated coastal areas and plains of the east

On the southern side of the Himalaya, developments are equally massive. India is developing its hydropower capacity within the framework of its national 50,000 MW initiative, with the aim of increasing the share of hydropower in the national energy mix and reducing dependency on energy imports. Again, energy transfers from mountains and highlands to plains, in this case from north to south, are the core of the initiative. The mountainous states in the north are seen as the country's powerhouse of the future. In the mountains of Himachal Pradesh, for example, the installed hydropower capacity is planned to be increased threefold between 2007 and 2017, from 6,000 MW to 17,000 MW, and the number of large hydropower plants from 22 today to 47

Smaller countries are no less active in developing their potential. Burma, with the support of India, plans to increase its capacity by a factor of eight by 2020, from currently 1,500 MW to over 11,000 MW. In Lao PDR, where 14 dams are currently in operation, over 100 dam projects for hydropower generation are in various stages of planning, most of them in the mountains and uplands. If these plans materialize, they would lead to the relocation of over 100,000 people, or 2.5% of the rural population, 47% of them poor. Most of the future electricity production will be exported to neighboring countries – India in the case of Bhutan, Thailand and Vietnam in the case of Lao PDR. The same pace and pattern of development appears in South America, where Bolivia is working with Brazil on a huge facility of close to 4,000 MW capacity in the Amazon region. The mutual dependency resulting from such collaboration may give rise to increasing cooperation or conflict, possibly both. For the Andean states, mountain regions are the powerhouses of hydroelectricity generation. In Bolivia, 100% of hydropower is generated in mountain regions, and in Chile, Colombia and Peru, the share of mountain hydropower is about 95%. Ecuador follows in fourth place, generating about 85% of its hydroelectricity in the mountain regions (Policy Brief Andes 2012).

In the industrialised world, hydropower is increasingly being reconsidered as a source of energy for the future, a policy shift prompted by the climate debate and, especially, the Fukushima nuclear disaster. Switzerland, for example, has identified 14 new sites for hydropower generation, including sites in protected landscapes of national importance, mostly for pumping and storing water to be used during periods of peak demand. Austria and Germany are also opting for renewed hydropower development, following a joint declaration of the three states. Again, mountain areas are the preferred arenas of this development.

As these countries, like many others in the industrialized world, have harnessed most of their potential, there are indications that the issue of safe and clean energy supply might in the future overrule other green agendas in the political debate such as the conservation of protected landscapes.

The controversy over large hydropower...

Large-scale hydropower development has been a controversial issue in recent decades. Very often economic considerations have taken precedence over environmental and social aspects. In mountain regions, this has disruptedthe livelihoods and habitats in mountain regions through loss of land, siltation, and compulsory relocation of populations without adequate compensation and prospects of alternative livelihoods, often leading to increased or new poverty. The impoundment of large water reservoirsalso creates a special risk of induced seismicity in susceptible regions, including greater risk of earthquakes, dam ruptures, and flash flooding.

Although global standards for large-scale hydropower development have been established (World Commission on Dams Report 2000), they need to be adhered to and their application enforced and monitored before such schemes can be supported as a pathway to advance green energy generation. If developed well, experience shows that hydropower facilities can have multiple benefits as multipurpose water infrastructures. Apart from providing clean energy, they support water conservation, irrigation, help manage floods and droughts, and improve water allocation across a complex set of users (World Bank 2009). They can be a source of income for mountain regions if they receive a share of the tariffs collected from concessions and of the proceeds of power sales, or if adapted industry and services emerge in the wake of hydropower development – in short, if downstream benefits are shared with mountain regions.

...and the benefits of small hydropower

Small hydropower schemes have shown their value for providing green electricity especially in mountain areas with their complex topography and dispersed settlements. They provide electricity for lighting, telecommunication, and motive power for appliances and small industry. Small hydro schemes are low carbon/low cost, less environmentally damaging, and independent of grids. If a grid is available, excess power can be fed into it and create additional income through feed-in tariffs. They generally do not involve the relocation of people.

There is abundant experience relating to small hydropower installation and management in many mountain areas worldwide. China leads the world not only in large, but also in small hydropower development. By the end of 2006, the country had established about 40,000 small stations mostly in the mountainous west of the country. With close to 30,000 MW, their aggregate capacity was higher than two Three Gorges schemes, benefiting more than 300 million people living in economically underdeveloped regions. Based on over 50 years of experience in the country, small hydropower development in China forms part of an integrated development approach that increases its effectiveness. It includes an array of different funding schemes, construction of local grids, cost-effective equipment produced domestically, trained human power for construction and management of the power plants, and, importantly, promotion of rural industries run on electricity (refocus.net 2004).

In the Hindu Kush-Himalaya, Nepal and Pakistan have rich experiences in small hydropower development, especially relating to community involvement in planning, constructing and operatign such facilities. They also have an industrial base that produces the electrical and mechanical equipment and the in-country expertise to install it, thereby providing a variety of green jobs in the secondary sector. In the remote mountain areas of Northern Pakistan, for example, small hydropower was introduced in the 1990s as a community-based initiative by non-governmental organizations including the Aga Khan Rural Support Programme. By 2005, that Programme had built 240 small plants with a total capacity of more than 10

Moving towards more sustainable hydropower development – the case of Nam Theun 2, Lao PDR

For the Nam Theun 2 dam and hydropower scheme in Lao PDR, 6,300 people from 15 villages had to be relocated. In an evaluation study carried out one year after the completion of the facility, 87% of the resettled people said their situation was better than before resettlement. Key for this positive response was a comprehensive compensation arrangement, which did not only include relocation, but also helped rebuild the livelihoods of resettled populations. Under the auspices of the World Bank, the private investors of the power facility from France and Thailand invested millions of USD in this compensation scheme, which also included mitigating social and ecological effects of the dam. The scheme led to a series of laws and regulations that also apply to future projects. However, as one World Bank representative had it: "At the end of the day, a sustainable hydropower project needs a responsible investor with a long term view, and a government willing to monitor implementation and compliance with such laws and regulations".

Source: CDE 2012.

MW. A Clean Development Mechanism project was registered in 2009 to construct 103 new plants with a total capacity of 15 MW (ICIMOD 2011).

UN system supports small hydropower development

UNIDO, the United Nations Industrial Development Organization, is currently implementing small scale hydropower projects in China, India, Indonesia, Sri Lanka, Zambia, Tanzania, Uganda, Kenya, Nigeria, Ghana, Rwanda, and Mali. The agency is also developing a large umbrella programme with a focus on South-South collaboration, to establish about 100 small hydropower projects in Africa in the next three years, and replicate them in other regions such as South America and Asia. Technical support is provided by the International Centre for Small Hydro-Power (IN-SHP) in China. (www.unido.org)

Source: UNIDO 2011.

Small hydropower is much less controversially debated than large hydropower. Its benefits extend across all three dimensions of sustainability.

Environmental benefits: these include the substitution of diesel-based power generation, the reduction in deforestation and degradation of natural habitats, and loss of rare plant and animal species threatened by excessive cutting of wood and shrubs for cooking, and heating in winter, which reduces greenhouse gas emissions.

Economic benefits: small hydropower provides a large number of rural households with electricity for both domestic and productive applications, including motive power for milling, small enterprises, and other needs. It creates opportunities for expanding livelihood options and for poverty alleviation, through value-added services in agricultural production, farm-forestry products, the local gems industry, and tourism services. It has also helped communication with the wider world in supporting the spread of television, computers, and mobile phone networks. Experience in rural areas of Nepal has shown that Kerosene consumption declined from 9 to 1 liter per household per month following small hydropower installation. For an average village with 170 households, this represents a saving of about USD 3,800 per year. This may seem small, but it is large relative to average annual incomes of roughly USD 500 in countries like Nepal. Small-scale hydropower also generates significant savings by eliminating the need for national power utilities to provide expensive transmission lines to remote areas.

Social benefits: Electrification has reduced the drudgery of women and children carrying fuel wood and provided night time lighting for study and leisure. Reduced use of fuel-wood and kerosene also means less indoor smoke pollution and related respiratory diseases, and lower incidence of in-house fires. Labor-intensive domestic activities such as the washing of clothes have become easier with electrification, as pumped water becomes more readily available.

A proven option for mountain development with a large potential for upscaling

Based on experiences in northern Pakistan, Nepal, China, and many other countries, small hydropower generation appears to be an ideal option for remote mountain regions where human populations are scattered and the extension and maintenance of a national grid is expensive owing to difficult terrain. The financing mechanisms and business model used in Pakistan also allow for scalability based on multiple partnerships, including the private sector. Public funds are leveraged to raise community equity, in addition to funds from capital and carbon markets. The ownership of smaller units is community-based, whereas larger units of 0.5 MW and higher are designed to operate as formal power utilities, with the triple bottom-line of economic gain, social services and environmental protection. The upscaling potential is substantial, if supported by enabling government policies and incentives, for example by building and maintaining local grids and by allowing local investors and community organizations to generate clean hydroelectricity to feed such grids, and by paying for what they feed in.

How small hydropower protects the Giant Pandas and makes housework easier

Rural electrification based on small hydropower generation has gradually reduced the rate of deforestation in Wolong Natural Reserve, Fechuan County, in China's Sichuan Province. Wolong is home to the giant panda and the largest panda reserve in China. The first plants were established in the 1960s. Small electric stoves for cooking and heating, subsidized and adapted to local conditions, were part of the scheme and a key element for motivating people to shift from firewood to electricity. In the early 1990s, 30% of the population of Fechuan used electricity for cooking and heating. In the center of the county and in the towns, this rate was 72%.

(www.re-focus.net 2004)

More green energy options

While large, mini- and micro-hydropower generation offer the most promising green energy options for mountain regions, and larger scale projects can serve

bigger downstream populations as well, there are many other green energy and thus green economy options for mountain regions. Biogas has proven effective in regions as diverse as Nepal and Peru (see box on Biogas in Nepal); improved wood stoves contribute significantly to household energy needs in many countries; and more technically advanced options such as wind and solar are being tested in mountain ranges from Appalachia in the US to the Tien Shan mountains of Central Asia.

There are many options for the use of solar energy in mountain areas, especially in regions with dry climate, and in subtropical and tropical mountains. Solar cookers are widely used in the mountain regions of China and India, and there have been initiatives to promote them in Nepal and Pakistan as well. Space heating using passive solar building technologies such as insulation has been used to retrofit buildings in Tibet and in Ladakh. Lighting with solar home systems has been successful in many mountain areas where isolated solutions are more cost-effective than centralized ones because of remoteness and low population densities. Solar power also has great potential for telecommunications, television, radio and computer operation; almost all remote airports and telecommunication facilities in Nepal, for example, are powered by solar energy.

More efficient stoves for greening mountain livelihoods

While discussing the potential of new alternatives for power generation such as biogas and solar, it must not be forgotten that the large majority of the mountain population – at least 650 million people – live in the mountains of developing countries, where woody biomass is the major source of energy. In Africa and Asia, wood is the dominant energy source. In Nepal and Bhutan for example, woody biomass meets more than 80% of total energy requirements. People living at high altitudes require more wood for cooking and heating than those living at the lower altitudes. In the Hindu Kush-Himalaya, for instance, per capita firewood use by people living at altitudes above 2,000 meters is nearly three times greater than for people living below 500 meter. As a result, wood for cooking and heating is becoming increasingly scarce in many mountain areas, especially in dryland mountain regions. In the northern mountains of Pakistan, deforestation and loss of vegetative cover is widespread, causing land degradation, slope destabilization triggering landslides, mudflows, and floods that that lead to the loss of life and property. The main driver of these developments is extensive wood use for house construction and fuel.

To find solutions to this problem, the Aga Khan Development Network (AKDN) has set up a research and extension program. By 2007 it had installed energy efficient products such as fuel-efficient stoves with chimneys, water heaters, and wall and floor insulation in 27,000 mountain households, benefiting about 250,000 people in close to 300 villages. The products are built by local artisans. The program has improved the well-being of households while at the same time reducing the regional carbon footprint. It represents a significant contribution to greening local livelihoods. Biomass consumption was reduced by up to 60%, thus saving 100,000 tons of wood and preventing an annual CO2 emission of 160,000 tons. The health status of villagers – especially women and children – has improved thanks to reduced in-house air pollution. Household disposable income increased by 25% on average due to lower expenditures for fuel and health.

Biogas in Nepal

Biogas technology was first introduced in Nepal in 1955 and household biogas digester plants (which transform biodegradable materials such as manure, sewage, municipal waste, green waste, and plant material into gas) have been developed and produced in Nepal since 1977. Nepal's biogas support programme can be rated as a successful rural development programme carried out in partnership between government, donors, the private sector, NGOs, community-based organizations, and local communities and households. Investment subsidies by government and different organizations, loans at low interest rate, and a long term repayment terms by banks are considered as key elements for the success of biogas dissemination.

A quarter of a million plants installed

By mid 2011, close to 250,000 domestic plants have been installed in all 75 districts of the country. Due to the effective enforcement of quality control mechanisms, around 93% of the installed plants are operating. Biogas technology has multiple benefits, including the reduction in time and energy spent by women and children collecting firewood for cooking. Biogas plants with attached latrines have promoted better sanitation in rural households. Use of biogas also promotes local employment as it requires skilled people for the construction, maintenance, marketing, and financing of biogas plants. Moreover, the residual biological slurry can be used as organic fertilizers to enhance crop yields. Biogas technology supports forest conservation by substituting biogas for firewood and reduces green house gas emissions.

Nepal's Biogas support Programme has been a success in many aspects – in terms of number of plants, high operational rate of the plants installed, local skill developed, private sector involvement, local peoples' participation, and integration with micro credit and other rural development activities.

Edited from: Amrit Karki, Jyoti Karki; case study by courtesy ICIMOD

Products that increase energy efficiency, particularly of wood, have also been promoted in other mountain areas such as the highlands of Ethiopia and Eritrea. In Eritrea, a government-led program supported by external donors promotes wood-saving stoves designed by the Ministry of Energy. The program has been successful in establishing several thousand stoves in the country's highlands. The stoves reduce fuel consumption by 50-60%, which is important in an area where forest cover has been reduced to less than 1% of the land surface, and where people have resorted to using dung for fuel, thereby burning fertilizer that could otherwise be used to improve the fertility of the land and hence food security. In-house air quality and human health have also improved. The verified emission reduction per stove is 2.3 tons per stove per year – a small but real contribution for climate change mitigation that could be replicated elsewhere.

Enhancing and securing mountain ecosystem goods and services

Harsh climates, marked topography, and natural hazards make mountainous environments particularly vulnerable to inappropriate land and resource use practices. Environmental degradation leading to the loss of mountain ecosystem goods and services, on which a green economy so much depends, is often more difficult to reverse than in other regions. Since mountains play a decisive role in freshwater provision, water resources management requires special attention. Watershed management is an important and classical tool to achieve this end. Watershed management is as old as agricultural activities themselves. Humans have manipulated water and slopes for at least 5,000 years in order to support cultivation, secure the provision of water, and control droughts and floods. Today, most national governments address watershed management in their water, soil, or forest conservation policies. More recent instruments include incentive-based approaches based on novel markets for specific environmental services such as clean water or biodiversity. Examples of such tools are payment for ecosystem services (PES), payment for watershed services (PWS), and reduced emissions from deforestation and forest degradation (REDD).

The program approach: Lessons from watershed management

Watershed management as a global concern appeared on the international development agenda in the 1970s. With the support of international donors, many countries engaged in such programs, typically in mountain or highland-lowland contexts. With a mandate for natural resource management, food security, and livelihoods, the FAO has played a leading role in watershed management since the beginning. Due to its long experience in the sector, the UN appointed FAO as Task Manager for Chapter 13 of Agenda 21 "Managing Fragile Ecosystems: Sustainable Mountain Development" in 1992. Promoting integrated watershed development and alternative livelihood opportunities is one of the two main program areas of the Chapter. FAO also hosts the global Secretariat of the Mountain Partnership.

Over time, FAO has progressively built up a conceptual and operational framework that links watershed management to sustainable mountain development, forest hydrology, and disaster risk management. In close collaboration with other UN agencies, governments, nongovernmental organizations and research institutions, and across its technical departments, FAO supports countries through its normative work, a strong field program, and support to international processes. In the twenty years since the United Nations Conference on Environment and Development, FAO has implemented 53 field projects in 45 countries in Asia, Latin America, Africa, the Near East, and Europe (see map). Of these, 17 projects had a significant mountain development component (see table). The elaboration of a full inventory including projects of other departments at FAO that include a significant watershed management and/or sustainable mountain development component is currently under way. In general, field projects combine activities for sustainable management of natural resources, such as afforestation or terracing, with activities for improving local livelihoods and with policy advice, for example in the field of legislation.

Finances
Budget of FAO's watershed management component USD 1,500,000
Overall budget per watershed: USD 90,000: Implementation of field activities: USD 50,000 Capacity development/building and staff time: USD 40,000
Beneficiaries
Estimated population of the 17 mountain watersheds: 61,200 people • Average population per watershed: 3,600 people

FAO's mountain watershed management activities: funds and beneficiaries.

In 2002-2003, FAO together with key organizations undertook a thorough review of past and current approaches to watershed management. The results were summarized in The new generation of watershed management programmes and projects. The new approach (see Box) is currently implemented and tested at field level. One of the main characteristics of this approach is the embedding of the resource management part of watershed management in overall local socio-economic development – in the past there has been confusion between watershed management and overall rural development. Other important aspects of the new approach are its focus on multi-stakeholder participation linking social, technical, and policy concerns in a collaborative process; the recognition of the key role of upstream-downstream linkages; and the consideration of long-term impacts as well as long-term planning and financing.

Global change including climate change, increasing occurrence of natural disasters, population growth, expansion of commercial agriculture, and urbanization compromise the role of mountain ecosystems and watersheds in providing environmental goods and services. Degradation and decreasing water flows seriously affect agricultural production and food security and threaten the supply of water to downstream areas, including large urban centers. There is increasing evidence that the provision of water, energy and food will be among the main challenges for global development in the coming decades. Sound watershed management embedded in sustainable mountain development is important for addressing these challenges.

Mountain ecosystems and watersheds are essential building blocks for long-term sustainable global development, poverty alleviation and the transition towards a green economy. They also play a crucial role in global efforts to climate change adaptation and mitigation: since 28% of the world's forests are located in mountain areas and watershed management projects include afforestation and management of forests, mountain watersheds have a huge potential for carbon storage and sequestration, and should be considered for funding mechanisms such as REDD in developing countries.

The demand for goods and services from mountains and watersheds has grown considerably and will continue to do so. In the context of a green economy, new opportunities for investment by the private and public sector are emerging, for example in renewable energy and ecosystem services. This offers scope for economic development, but also puts increasing pressure on already fragile environments and scarce resources. The implementation of appropriate institutional arrangements is essential to ensure that new opportunities bring benefits and do not perpetuate degradation of mountain socio-ecological systems.

Changing paradigms: FAO's framework for watershed management

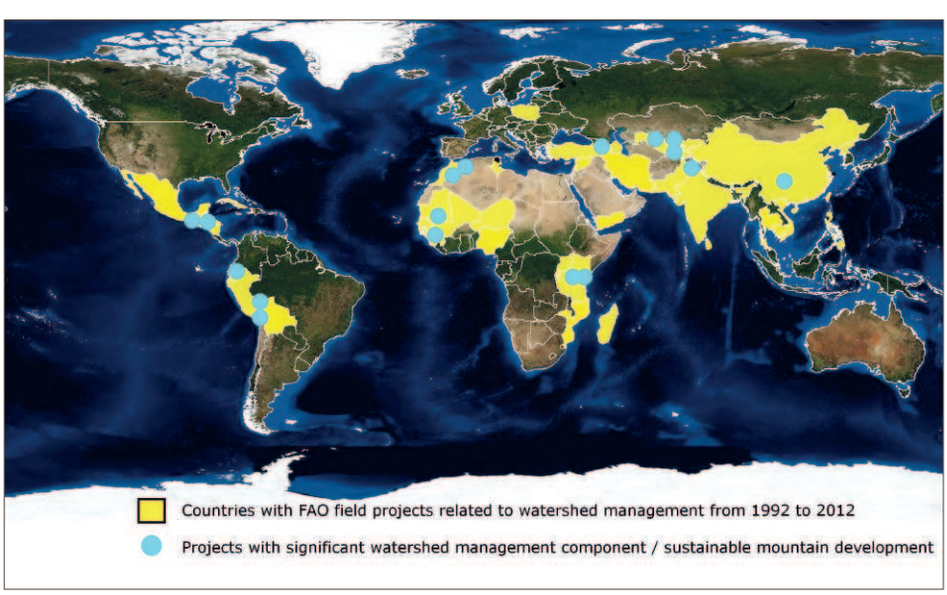
Old approach

- Treating symptoms
- Insufficient attention to capacity building
- Lack of clear focus
- Sector based research, education, and training
- Top-down or bottom-up
- Intuition and common myths
- Short-term planning and financing
- Women involvement

New approach

- Treating underlying causes
- Government capacity and institutional arrangements
- Interventions with focus on water
- Multi-disciplinary research, education, and training
- Bottom-up and top-down
- Scientific and tested evidence
- Long-term planning and financing
- Gender balance in decision-making
- Capacity building, communication
- Climate change impacts
- New financing mechanisms (PES)

Source: FAO



FAO projects related to watershed management implemented since 1992 worldwide.

Finally, suitable tools and methods for the valuation of mountain goods and services and for adequate compensation mechanisms have to be put in place.

In line with these developments, FAO is currently experiencing an increase in the number of requests for technical assistance and policy advice related to watershed management, sustainable mountain development, and forest hydrology. Experience shows that it is absolutely crucial to link the natural resource management part with activities that improve local livelihoods and with work at the policy level, including issues of good governance, decentralization, and specific sector policies. The participation of key stakeholders concerned by a specific watershed program, with a focus on upstream/downstream linkages has been shown to be indispensable. FAO anticipates that the number of requests from countries and partners will continue to grow and advocates for sustainable mountain development and watershed management to receive a prominent place on the international development agenda.

20 years of watershed management: lessons learned from Rio 1992

Based on the implementation of watershed management and sustainable mountain development worldwide since 1992, the following lessons learned and paradigm shifts need to be taken into account and reflected in the design of forthcoming projects:

Old approach to watershed management	New approach to watershed management
Integration of socio-economic issues within watershed management programs	Emphasis on watershed natural resource management as part of local socio-economic development processes
Focus on "people's" or "community" participation, with an emphasis on bottom-up, participatory planning	Focus on multi-stakeholder participation, linking social, technical and policy concerns in a pluralist, collaborative process
Rigid program design that overestimates central government's capacity to enforce policies, and lacks adequate institutional/organizational arrangements at the local level. Short-term planning and financing	Flexible program design that adjusts to local governance processes. Long-term planning and financing
Implementation responsibility entrusted to "heavy" institutions, such as donor-assisted programs or government watershed authorities	Implementation responsibility entrusted to "light" institutions such as watershed management fora, consortia and associations, with programs and authorities playing a facilitating and subsidiary role
Focus on on-site, short-term effects. Small-scale projects with little watershed or basin-level coordination	Focus on upstream–downstream linkages and long-term impacts. Local-level processes coordinated at the watershed or basin level
"Quick-and-dirty" participatory assessment and evaluation (e.g., participatory rural appraisal), with little or no linkage to natural and sociological evidence	Dialogue between local and scientific knowledge in "fairly-quick-fairly-clean" action research processes, involving a variety of stakeholders
Belief that access, tenure, and social conflicts in watersheds can be solved by technically sound interventions	Awareness that most access, tenure, and social conflicts in watersheds are rooted in society and politics and should be managed through continuing negotiation
Emphasis on bottom-up approach	Combination of top-down/bottom-up approach in dialogue towards institutional development

Source: Watershed management and mountain team at FAO

The compensation approach: Payment for Watershed Services (PWS)

Environmental services provided by mountain areas such as freshwater, biodiversity, or disaster prevention are generally perceived as public goods whose value is rarely expressed in monetary terms. This leads to an economic imbalance between downstream beneficiaries and upstream providers of the services. Mechanisms to compensate mountain communities for such services have thus to be developed and put in place. In many industrialized countries, subsidies or direct transfer payments have become the norm. Where such mechanisms are not available such as in many developing countries, PES schemes offer a promising alternative. Given the importance of mountain waters, this is especially true for PWS. Payments can come from different sources: direct water users, local and national governments, and the international community. What sets PWS approaches apart from a classical conservation and development approach, such as watershed management, is their conditionality: service providers sign a contract agreeing to specific activities in exchange for a payment, which can be cash, in-kind, or a combination. NGOs have often played a lead role in the design, preparation, and implementation of PWS projects and programs. A summary of the experience made with such initiatives is presented in the following paragraphs.

Experience with PWS schemes across different mountain regions

A large body of experience exists on how PWS schemes should be established and operated so that they are successful and sustainable (see box). The biggest hubs for experimenting with payments for watershed services are South America and Central America. In Central America, the program in Costa Rica has garnered 12 years of experience. Since the increase in water taxes in 2006, with a third of the revenues allocated by law to the trust fund managing the program, no new contracts have been signed. Although proposals for national-level programs in Panama and El Salvador have met with resistance, many small-scale initiatives are emerging in the region. The water fund in Guatemala, for example, has engaged several beverage companies and irrigation groups.I In 2011 water fund representatives conducted negotiations with hydroelectric and agro-industrial companies, with support from World Wildlife Fund and CARE. Mexico began payments for hydrological services in 2003, and since then has included other services as well. The program has established a monitoring system based on change in forest cover using geographic information systems and satellite technology.

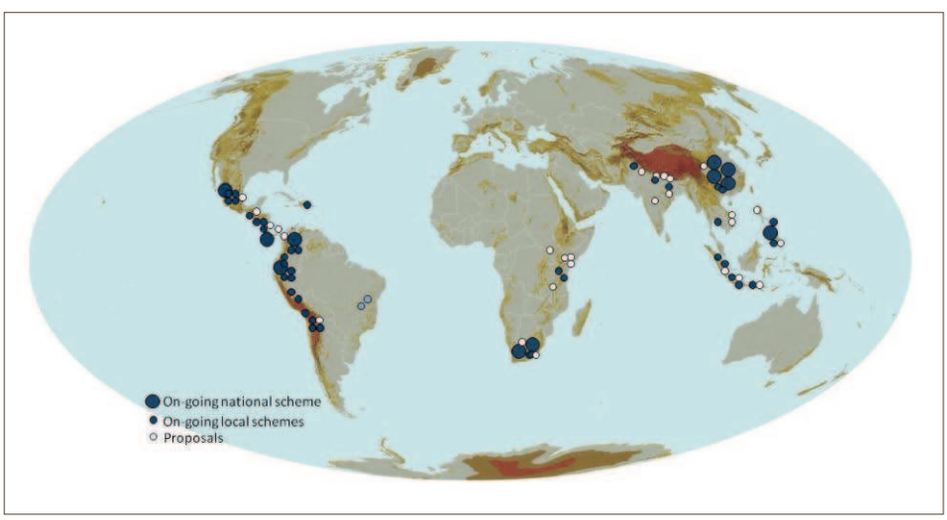
South America has seen a proliferation of initiatives, especially in Ecuador, but also in Colombia, Brazil and Peru. Most of these schemes pay for the water quality services of well-managed forests. Most projects are local, but negotiations for upscaling continue, and the potential of new funds from REDD may provide the incentive required for national legislation.

In Asia, China has the largest government-led programs for environmental services: by 2008, China had a total of 47 identified programs, mostly including PWS components. Payments have grown from an estimated USD 1 billion in 2000 to about USD 7 billion in 2008, covering 270 million hectares. Most of these payments are for forest-related activities, including the Sloping Lands Conservation Programme, which converts cropland into forests and is the largest land retirement program in the developing world. Other programs are dealing with grasslands improvement, mainly in the mountain regions in the West of the country.

Elements of workable PWS and PES schemes

- Clear definition of the environmental services to be provided, and solid understanding of the market where these service will be sold
- Clear and consensual evidence of the link between land use and service provision
- Acceptable value assigned to environmental services, based on sound economic analysis and extensive consultation with beneficiaries
- Payments high enough to compensate the costs to land users, but acceptable to beneficiaries
- Payment mechanisms designated to deliver monetary and non-monetary benefits such as infrastructure or capacity development for land users
- Low transaction costs through collective negotiations and contracts that guarantee equity (i.e. solid cooperative institutions and local associations)
- Low transaction costs and effective monitoring of compliance and provision of services
- Stable and continuous flow of revenues to ensure long-term sustainability of the system, including access to start-up financing
- Establishment of a governance structure that oversees, gathers, and manages the funds from beneficiaries

Adapted from: Pedro Regato 2011



Global Mountain Regions and locations of Payment for Watershed Service (PWS) schemes. Grey colour on the map represents non-mountain regions; brown colours represent mountain regions. Map prepared by Ina Porras, IIED (category and location of projects); and CDE University of Bern (world map and mountain areas).

Payment for Watershed Services helps secure water for Quito, Ecuador's capital

Ecuador's capital Quito receives its water supply from the Andean mountain range, in particular from the Cayambe-Coca and Antisana Ecological Reserves, which are inhabited by 27,000 people. Both areas are used for agriculture and livestock grazing, which threaten the quality and quantity of water available for drinking, irrigation, and power generation downstream.

In 1999, the water users of Quito through the municipal government and the hydroelectric companies agreed with private and state conservation organizations to create a fund that collects a water consumption fee from water users to support environment-friendly land use practices and reforestation in the ecological reserves upstream. The goals of the program are to maintain stream flow and water quality and to protect biodiversity by a change in land use practices. The municipality and its partners collect the money and either undertake compensation measures themselves or pay upstream land owners, who represent the third party in the scheme, for changing land use practices.

The Fund is managed by an asset management company; decisions are made by a Board of Directors, which is made up of representatives of the creators of the fund and private and public users of the watershed. The fee amounts are calculated based on the costs of patrolling the reserve. About 1 % of the revenue from hydropower generation and water use fees goes into the Fund. That small sum is used to maintain the upstream Cayambe-Coca and Antisana Ecological Reserves. It is planned to expand the program to the rest of the Condor Biosphere reserve and to determine the actual costs of water protection

Pratt and Shilling: High Time for Mountains. World Bank: World Development Report 2002 (background paper)

South and South East Asia, through the RUPES program (Rewards for Use of Shared Investment in Pro-poor Environmental Services), has been a key player in ecosystem service initiatives. The program works in Indonesia, the Philippines, Vietnam, India, and Nepal, largely in mountain areas. The region has been at the forefront of PWS research and tool development. For example, the Rivercare Project in Sumberjaya, Indonesia, links rewards to measured sediments, creating a whole set of experiences in community monitoring and ecosystem delivery. However, few larger initiatives have been implemented.

Interest in PWS schemes in Africa abounds in the international community. The World Agroforestry Center has created a RUPES-African counterpart, concentrating on the East African Highlands. The Global Environment Faciolity, the World Bank, and other donors have promoted several scoping studies, including the Green Water Credits scheme in Kenya. The longest experience on the continent so far is the Working for Water scheme in South Africa, and a few pilot schemes in Tanzania and in Kenya. Overall, however, a majority of schemes still await implementation.

The challenge of targeting and effectiveness

While PWS as a concept has its merits and successes, a range of associated challenges remain. Targeting and effectiveness are two of them. Experience shows that it is generally easier for local schemes than for larger ones to target areas crucial for water supply. For example, a small scheme in Pimampiro, Ecuador, has contributed to stopping deforestation and to marked recovery of native vegetation, contrary to trends found in most neighboring villages. Before the introduction of environmental service payments in 2000, approximately 30% of the total area had been converted to crop agriculture and pastures, compared to only 14% in 2005. By contrast, the first years in the Costa Rica national scheme were found to have minimal impact on lands at risk. Learning from this experience, the second phase achieved a higher efficiency due to improved targeting. The need for improved targeting was also an issue in China, where experience from the Sloping Land Conversion Programme showed that 38% of the area converted from agriculture to forestry in Gansu Province was low slope area and hence at lower risk of causing erosion.

In general, it is easier to target point sources of degradation, such as mining, industrial or timber operations. Watershed management, however, usually entails a complex array of actions: livestock and pasture management, erosion control, selective logging and forest management, improved agriculture, careful building construction, and a number of location-specific controls. For this reason, non-point source PWS schemes are more difficult to implement and make well designed targeting essential for achieving effectiveness.

The challenge of monitoring and sustainability

Other issues related to PWS schemes concern monitoring and sustainability. Most PWS monitoring is focused on contract compliance rather than on measuring ecosystem impacts – there are important exceptions, such as New York City, which ties payments to water quality. Where monitoring exists and the scheme contributes to improving water services, it is important to assess whether this impact is temporary or sustained. Sustainability has been shown to be linked to the nature of the incentive: low value in-kind benefits were found to have

better acceptance than low-value cash benefits, as recipients are more likely to view in-kind transfers as compatible with reciprocal exchange. Timing and payment periods can also affect permanence. In Costa Rica and Ecuador, farmers are now only requested to protect the forest for the length of their contract; initial attempts requesting protection for 20-99 years were rejected by farmers because they did not give them sufficient flexibility to adapt to changing personal circumstances.

REDD: Reduced Emissions from Deforestation and Forest Degradation

REDD is an important emerging tool for conservation and sustainable development. It corresponds to a PES scheme focusing on forests, using financial, market-based incentives to reduce greenhouse gas emissions from deforestation and forest degradation. The basic concept of REDD is simple: since standing forests store carbon that can be measured and monetized, the monetized value of carbon can be used as an incentive for preservation. As with many other instruments, complexity emerges during program implementation, particularly in ensuring that amounts of carbon are accurately measured, safeguarding the rights of indigenous people, and guaranteeing the transparent and equitable sharing of benefits from carbon sales. Additional complexities concern the selection of markets to be utilized for selling carbon credits, with choices ranging from "sales" to donors, utilizing compliance markets, or selling directly to corporations in capital markets. Further challenges arise from identifying appropriate tools to be used to determine an agreed upon and verifiable rate of deforestation, which is essential for determining how much carbon can be reliably sold.

Despite these difficulties, REDD offers advantages as a tool for conservation and sustainable development. One of the major advantages of REDD is that the mechanism requires a minimum project life of 20 years, and preferably a project life of 30 years. This requirement for long-term commitment contrasts with the usual donor cycle of 3 to 5 years and is a more realistic time frame for creating lasting changes in difficult and remote environments, which are more likely to be areas with large tracts of intact forests.

The landscape between Mount Makalu and Mount Khanchenjunga in Nepal's Eastern Himalaya, for example, contains more than 190,000 hectares of intact broadleaf forest that is home to approximately 25% of the world's remaining red panda habitat. There are approximately 200,000 local people from more than 10 separate ethnic groups living in the area. With high levels of poverty, many of these communities have few opportunities for improving livelihoods from tourism and other activities. Many community members are thus compelled to leave Nepal to find employment. An appropriately designed REDD project, currently in preparation with support from The Mountain Institute (TMI), offers hope to reverse these trends It would simultaneously protect high value, carbon rich forests, while offering livelihood improvement options. If protected, these forests could provide many downstream benefits such as erosion control, disaster risk reduction, and water storage and watershed management benefits. REDD section by Jane Pratt

Natural hazards and risk in mountains

Mountains are high risk areas. Natural hazards can cause damage, destruction, injury and death at any one moment in time. They disrupt the flow of ecosystem goods and services on which a green economy critically depends. As mountains are often located in tectonically active zones, susceptibility to earthquakes is higher than in other areas (Hewitt 1997). On global average, 36% of non-mountain areas are susceptible to destructive earthquakes, but for mountain areas, this share is 55%; for the Andes it is as high as 88% and for the mountains of Southeast Asia, where almost half of the global mountain population lives, it is 71%.

There is growing evidence that many mountain regions have become more disaster-prone in recent decades and that a disproportionally high number of natural disasters occur in mountain areas. Aside from earthquakes, these include volcanic eruptions, dam bursts, landslides and rock falls, and avalanches. Relief operations are often hampered because roads and other important supporting infrastructure are destroyed by these processes. Human activity can also trigger hazards or influence their impact. The destruction of mountain forest or inappropriate land use are cases in point, as are improperly constructed dams, roads, or mining infrastructure. Encroachment of urban and rural settlement into risk-prone areas such as steep slopes or flood-prone valley bottoms can also have disastrous effects on people, infrastructure, and economy. At the same time, hazards and disasters can be seen as opportunities to promote development beyond reconstruction; sustain or even increase the flow of ecosystem services; and move affected regions towards a greener pathway of development benefiting local as well as downstream populations.

After the earthquake: greening the mountains of Pakistan

The response to the earthquake in Pakistan exemplifies a case of development beyond reconstruction much in line with the tenets of green economy. In October 2005, a disastrous earthquake struck the

mountain regions of northeastern Pakistan, affecting between 3 and 4 million people and killing over 80,000, and causing hundreds of landslides. In downstream areas, water channels, roads, and paths were blocked by rocks and debris. Flash floods and mudslides destroyed agricultural land and fruit tree plantations.

A massive relief effort was mounted by the Red Cross and Green Crescent, in which the control of hydro-geological hazards through collaborative watershed management became a key component. This component was implemented in 17 watersheds in a joint effort by FAO, District Forest Offices, and ICIMOD. Project activities included mapping the damage; participatory rural appraisal and institutional analysis; establishment of a Watershed Management Committee; development of a participatory watershed management plan; implementation of prioritized activities; on-the-job capacity building and training; and providing affected communities with temporary tent housing suitable for mountain conditions. Forestry-related activities received high priority. They included bioengineering (waddling, brush-layering, palisades); forest regeneration on degraded slopes; fencing off over-grazed mountain forests; and the introduction of controlled grazing. Tree nurseries and fruit tree orchards were established to support the afforestation and slope stabilization efforts as well as to improve incomes of the local population.

Institutional innovation followed. Traditionally the District Forest Offices did the planning and field implementation of forestry-related interventions. Following the establishment of the Watershed Management Committees, it was the communities that prioritized and planned the activities, while the District Forest Offices provided technical support. The project also promoted marketing agreements for crops with downstream demand such as flowers, and supported the integration of the crop and livestock sector at household level, as well as the processing of fruits and vegetables, including marketing.

Overall, the project has demonstrated the crucial role of forests for the rehabilitation of steep terrain. The bioengineering methods for the stabilization of landslides, an inherently green approach, were particularly effective and have the potential for replication much beyond the project area. Equally important, the Forest Department endorsed the participatory approach for projects aimed at the restoration of natural resources and livelihoods. The floods of July 2010 again created significant damage in the northeastern mountains. First assessments show that the communities in the project area were better prepared to cope with this new disaster, and that flood damage was comparatively low.

Mountain agriculture is green agriculture

Mountain agriculture is important for a green economy. First, the majority of the world's mountain population lives in rural areas and the majority of people in these areas are engaged in farming or pastoral livelihoods. Second, promoting sustainable livelihoods in mountain areas often means dealing with remote rural poverty. Third, mountains are hotspots of global biodiversity including agro-biodiversity. A large fraction of the world's most precious gene pools for agriculture and medicine are preserved in mountains. Of the 20 plant species that supply 80% of the world's food, six originated and have been diversified in mountains (maize, potatoes, barley, sorghum, tomatoes, and apples). Coffee and tea, with their roots in Ethiopia and the Himalayan region, are also mountain crops. Finally, mountain agriculture is basically green agriculture because industrialized large-scale production is often not possible due to topography. Moreover, owing to remoteness and difficult access, the use of external inputs such as fossil fuels, mineral fertilizers, and pesticides is typically lower or less widespread than in lowland farming.

The potato story

The potato's story begins about 8,000 years ago near Lake Titicaca at 3,800 m above sea level in the Andes mountains, on the border between Bolivia and Peru. There, research indicates, communities of hunters and gatherers who had first entered the South American continent at least 7,000 years before began domesticating wild potato plants that grew around the lake in abundance.

Some 200 species of wild potatoes are found in the Americas. But it was in the Central Andes that farmers succeeded in selecting and improving the first of what was to become, over the following millennia, a staggering range of tuber crops. In fact, what we know as "the potato" (Solanum species tuberosum) contains just a fragment of the genetic diversity found in the seven recognized potato species and 5,000 potato varieties still grown in the Andes. Although Andean farmers cultivated many food crops - including tomatoes, beans and maize - their potato varieties proved particularly suited to the quechua or "valley" zone, which extends at altitudes between 3,100 and 3,500 meters along the slopes of the Central Andes – among Andean peoples, the quechua was known as the zone of "civilization". But farmers also developed a frost-resistant potato species that survives on the alpine tundra of the puna zone at 4,300 meters.

Source: FAO 2008 www.potato2008.org/en/potato/origins

Mountain farming is not free of concerns. These include encroachment of monocultures in response to demands from national, regional, and global

markets; overexploitation of land resources due to population pressure and lack of economic alternatives; outmigration, land abandonment and decay of key farm infrastructure such as terraces in other regions, with as yet unknown effects on provision of environmental goods and services. Yet overall, and especially in comparison to large-scale industrial agriculture practiced in plains and lowland areas, it has many green merits, and these can be strengthened in many ways.

Promoting mountain farming livelihoods

Experience shows that successful approaches in promoting mountain farming livelihoods share important commonalities. They are typically high-value-added activities and they link upland sources to downstream users. Mountain products and services such as medicinal plants, timber and non-timber forest products, mountain crafts, recreation and ecotourism have found specific niche markets in neighboring lowland areas and abroad. The same is true for agricultural products such as potatoes, cheese, specialty fruits, wine, and many others (including illegal crops such as drugs). The potential for high-quality, high-value mountain products, often produced off-season, exists in every major mountain region of the world.

This can be illustrated by the Mountain Products Programme, which was launched by FAO in 2003 with funding from the Government of France. Following a global survey, promising products were analyzed and pilot projects carried out in selected mountain regions. These included the African mountains with coffee, macadamia, and honey in the Mount Kenya region; the Andes with coffee and cheese in Peru; Central Asia with medicinal plants and honey in Kyrgyzstan; the Hindu Kush-Himalaya with wild mushroom, silk, and handmade paper; and the Middle East and North Africa with argane oil, olive oil, saffron, and rural tourism in the Anti-Atlas Mountains of Morocco. The pilot projects engaged governments, growers, and private companies, with the aim of increasing production, processing and marketing of the products. The programme also set up regional web-based knowledge centres that provided information on products, policies and laws, and good practice for engaging in higher-value markets.

The saffron promotion program provides an example of how the Mountain Products Programme worked. Also known as "red gold," saffron is an important source of income for approximately 3,000 smallholder farmers in the Anti-Atlas Mountains of Morocco, who sell the product on local markets as cash needs arise. The production of the crop is deeply embedded in local culture and heritage and constitutes an integral part of the local agro-ecological system characterized by fodder crops, vegetables, olive and almond trees. A project involving the government of Morocco, FAO, a local NGO, and saffron producers was initiated in 2006 to support this high-value product. Following detailed value chain and market studies, the project started in 2008 with the overall goal to increase the income of mountain farmers by enhancing the capacity of saffron producers for safe storage, packaging and labeling, identification of niche markets, linkage to buyers, as well as management of cooperatives, improved negotiation skills, and certification including organic, fair trade and origin-based product schemes. Upon conclusion of the project in 2009 saffron producers had improved the quality of saffron and due to higher market prices, increased their incomes.

The Agrobiodiversity Initiative (TABI), Lao PDR

Launched in 2009, TABI, a joint Lao-Swiss Initiative, aims to improve the livelihoods of mountain communities in Lao PDR with a view to help reduce poverty, conserve biodiversity, and support the assimilation of a market-based agriculture system. The Initiative focuses on the productive use and conservation of agro-biodiversity resources; in particular Non-Timber Forest Products (NTFPs), which are used for construction, furniture, transport, medicinal purposes, and are essential for rural food security especially in times of rice shortage. Farmers are increasingly domesticating naturally occurring species to take advantage of evolving market opportunities, including export. NTPFs now provide up to 50% of villagers' cash income. Cardamom (Amomum sp.) and malva nuts (Scaphium macropodum), both used in traditional Chinese medicine, are the most important export products. Other important destinations are Thailand and Vietnam. However, the fast shift from subsistence farming to market economy in recent years, with a rapid expansion of mono-culture plantations and the resulting transformation of the small-scale upland agricultural landscape, has led to increased pressure on mountain resources, including NTFPs and biodiversity. TABI also aims to enhance community access and control over local resources and to establish an information hub for monitoring and evaluation, generating and sharing information, and policy advice. The Initiative strengthens international and national policy frameworks: Lao PDR acceded to the International Convention on Biological Diversity (CBD) in 1996 and is one of only a handful of countries with an Agrobiodiversity Programme.

Source: TABI Update, Issue No.2, November 2011.

A similar program led by NGOs focused on the promotion of medicinal and aromatic plants in Nepal. Poor mountain farmers in this country cut wild medicinal plants to earn enough to get through the harsh winters. The practice is unsustainable and

has led to serious environmental degradation. Since 2001, The Mountain Institute has trained more than 13,500 mountain farmers in the cultivation of medicinal and aromatic plants (MAPs), which are now cultivated on 1,380 hectares of private lands and community forests. When the cultivated plants became mature enough to harvest in 2007, the total annual income of farmers cultivating MAPs actually began to exceed program funding inputs, and total revenues to date have exceeded USD 1,400,000.

On the conservation front, TMI's programme has planted over a million seedlings of native tree and fodder species, which locally managed nurseries grew and then planted on over 500 hectares of community forests, roadsides, religious sites, and alpine meadows. Programme impact in the area includes increasing the population of wild medicinal plant populations by up to 80% since baseline data was first collected in 2004.

With a small team of 11 staff, the large number of farmers is reached by working through local NGO partners. This has helped build local capacities and create employment. Working with district or community-based NGO partners rather than those based in Kathmandu requires more investments in technical, administrative, and financial training, but has been shown to be critical to success: transferring these skills to the working level where the plants are produced enhances the prospects of long term sustainability.

As plant production volumes have reached significant levels, the program focus was shifted from ensuring sustainable supplies of plant materials towards creating locally managed enterprises, equipped with the organizational, administrative, and technical skills to function as local businesses. In Eastern and Central Nepal, the formal structure consists of local cooperatives, which offer significant regulatory advantages. At the start of the project, program staff conducted a market survey, following commonly traded plants from their collection to the markets where they were being sold. This helped establish market demand, identified existing trade routes and traders, and helped reduce farmers' risk at the start-up stages of the project. Program staff also interviewed farmers to understand their level of knowledge about the plants and their reproductive biology, to ensure that there was some degree of familiarity with initially promoted plants for cultivation. This also helped reduce risks. As farmer confidence increased, cultivation of additional medicinal plant species was promoted to reduce risks of monocultures, unexpected disease and pest problems and market fluctuations. Finally, working closely with Nepal government authorities, the programme introduced a government-approved system that certifies that plants have been grown on private lands, reducing tax liabilities, and allowing local growers to retain more of the benefits. Farmers have increased their incomes – some as much as five-fold, from roughly USD 500 to USD 3,000, with continuing increases expected. And by planting medicinal and aromatic plants on the berms of their fields, no land is lost for food production.

Promoting products from mountain farming: cases from Peru and Switzerland

In Peru, the International Potato Centre, the Ministry of Agriculture, indigenous producers, retailers, processors and supermarkets have worked together to develop and market a line of native potatoes in Lima, the country's capital and largest urban market with a population of 9 million, under the brand name T'ikapapa.

Peru is home to more than 2,000 varieties of native potatoes, the vast majority of which are cultivated above 3,800 meters, where other crops cannot grow. However, potato consumption has decreased as consumer preferences have shifted to imported rice and noodles. This has hurt the incomes of potato producers in mountain communities, of which many were food-insecure. T'ikapapa cultivation was established to increase and stabilize the incomes of potato farmers, alleviate rural poverty in mountain areas, raise consumer awareness about the nutritional value of native potatoes, for example by encouraging people to eat bread that includes potato flour, and promote food security by relying on domestic products. The government has also acted by reducing costly wheat imports.

The promotion of mountain products can also be successful in industrialized countries, especially if retailers and supermarkets are engaged. For example, COOP, one of the large retailers in Switzerland, has launched a product line called Pro Montagna ("for the mountains"). The line, initiated five years ago, now includes more than 120 mountain products, mostly in its food segment. Mountain regions benefit in three ways from the sale. The raw material must originate from the mountains, which brings income to mountain producers. Processing and production must take place in the mountains so as to retain value added in the mountains. Finally, a small share of the sales price declared on the package flows back to mountain regions in support of concrete local development projects. In 2011, Pro Montagna sales reached a total of CHF 32 million (USD 35 million), 7% up from the 2010 figure. This generated some CHF 840,000 (USD 900,000) for investment in mountain development, mostly in upgrading farm houses, stables, or local infrastructure.

Greening the industrial and mining sectors

Timber, mining and other extractive industries

Extractive industries have been held up for over a century as worst-case examples of "how not to do" green economic development in mountains. Clear-cutting of timber led to land-slides, loss of soil, erosion, and flooding in areas as disparate as Indonesia and Alaska. Large-scale mines were – and many remain – infamous for the devastation they have caused to local communities, ecosystems, and cultures. Even so-called "artisanal" mining caused disease and permanent damage to water sources from unregulated storage and use of heavy metals such as cyanide, arsenic, and mercury.

A small but increasing number of positive examples show that there can be a better way. Community-based forestry and selective logging practices introduced by large companies have demonstrated benefits both to conservation and economic development. There are now over 50 forest certification and timber certification programs worldwide, with the largest run by the Forest Stewardship Council and the Programme for the Endorsement of Forest Certification (a collaborative initiative of environmental NGOs, forest product companies, and civil society groups). A major factor in the growing success of such schemes is the commitment of governments and major private industries such as publishing and packaging to use sustainable paper sources – in large part responding to public pressure. In many countries, public procurement policies adoption of green building standards, and more onerous penalties for illegal logging have lent additional support to efforts at greening forest management and timber extraction.

Large mining operations, on the other hand, have proved much more difficult to operate in green and sustainable ways. Mining companies extract ores for an average of 30 years, then leave environmental degradation and ghost towns behind in the familiar "boom-bust" cycle that has long typified this industry. "Mountain top" removal in America's Appalachian range consists of huge machinery literally removing entire mountain tops to reach the coal seams underneath. The overburden is dumped into adjoining valleys and streams, causing permanent damage. When the coal deposits are depleted, companies simply move on to the next location. The drama of mine rescues from Chile to China in recent years emphasizes the continuing dangers to local miners, for whom mining is often the best job available.

The vicious cycle of environmental degradation and human harm caused by mining is not inevitable, as shown by the example of the Antamina mine in Peru. The site, at elevations between 4,200 and 4,700 meters is on the eastern slope of the Andes, some 380 km from the sea. In an agreement signed with the Government of Peru in 1998, the Comania Minera Antamina agreed to invest USD 2.5 billion over three years to construct a mine that would operate for 20 years, producing 1.3 – 1.4 million tons of copper/zinc concentrate each year. The company planned to truck the ore to the port through the magnificent and ecologically significant Cordillera Blanca range, which is home to impoverished indigenous communities. The truck route, in fact, would cross a pass of 5,300 meters altitude right through the Huascaran National Park, a biological and cultural treasure that already was recognized with three levels of protection: as a National Park, an International Biosphere Reserve, and a World Heritage Site.

Local communities and NGOs, led by The Mountain Institute, entered into a dialogue with Antamina, explaining that alternative options were in the company's own best interests: running 35-50 ton trucks over that pass would entail high maintenance and fuel costs, and risk disruption if any of the trucks broke down on the narrow road, since departures were expected at four-minute intervals around the clock. A slurry pipeline set below 3,300 meters and circumventing most of the park was eventually accepted, and has proven to be more cost-effective than the truck route.

For such corporate-community-NGO partnerships to work from each partner's respective strengths and to mutual advantage, however, mechanisms are needed to allow the non-corporate partners to be compensated for their legitimate contributions to avoiding and mitigating adverse environmental and social impacts. Following the initial negotiations on transporting the ore, NGOs worked with Antamina and local communities to create an innovative "Consortium for Mining and Environment" (CME). The CME unites NGOs and civil society representatives working in and knowledgeable about the region, and identifies priority actions to deal with the environmental and social priorities of local communities. With funding from Antamina and several other mining interests in the area, as well as a decision-making structure that ensures a preponderant weight to local representatives, the CME is providing objective technical advice, bringing stakeholders together, and helping the mining companies fulfill their sustainability objectives in an efficient, effective, and equitable manner.

Green services? The case of tourism

Before the advent of ecotourism, mountain tourism too often resulted in unsustainable development that displaced local people and undermined the local ecology and livelihoods for the benefit of outsiders. In U.S. ski resorts such as Aspen, Colorado, people who work there can no longer afford to live. Second homes and mountain resorts around the world have similar impacts. Well-designed green tourism, in contrast, offers special opportunities for sustainable livelihoods in mountain areas because it generates high income relative to alternatives.In the best scenarios, green tourism can integrate and even promote local culture and traditions.

Tourism – a dynamic economic sector – what prospects for mountains?

Over the past six decades, tourism has experienced continued expansion and diversification and became one of the largest and fastest growing economic sector in the world, increasing from 25 million international arrivals in 1950 to 842 million in 2006, a more than 30-fold increase. Many new destinations have emerged alongside the traditional ones in Europe and North America. Growth has been particularly fast in the world's emerging regions; the share in international tourist arrivals in emerging and developing economies has steadily risen from 31% in 1990 to 47% in 2010. No disaggregated data are available on mountain tourism at a global level, but its potential in an increasingly urbanized world is highlighted by the European Alps which have over 540 million overnight stays per year, making them the second most important tourist region in the world after the Mediterranean coast. At a global level, the importance of tourism varies greatly between different mountain regions and is also unevenly distributed within the same region, including the European Alps. The question of what would constitute green forms of tourism is still much debated.

Source: UN World Tourism Organisation-Tourism Highlights 2011, CIPRA 2011

The Mountain Institute-IUCN Great Inca Road project, for example, helps extremely poor communities in the high Andes by restoring landscapes, biodiversity, and cultural assets along portions of the 9,000 km Inca trail. The project promotes community-based tourism in three of the six countries traversed by the trail: Ecuador, Peru, and Bolivia. The preservation of some of the world's most fragile ecosystems, reintegration of functional connections of Andean cultures that existed in pre-Colombian times, preservation of indigenous art, culture and religion, and poverty alleviation were integral to the design of the project. With support of the Andean Community of Nations and the Government of Spain, the project widely used participatory approaches, including the involvement of grassroots individuals and institutions in support, design, and implementation

Since its inception in 2003, the Great Inca Road program has resulted in numerous positive achievements: developing participatory management plans; preparing maps and baseline surveys; reinforcing protection of existing well-conserved areas and restoring degraded areas (see Box on paramo ecosystem conservation); undertaking projects to enhance incomes of local communities, including ecotourism, weaving, and improved agricultural production; and developing methodologies to implement these

Integrating Conservation and Livelihoods.

The paramo ecosystem, located at roughly 9,800 m.a.s.l., is a mosaic landscape that forms an archipelago of wetlands along the crest of the Andes from Venezuela through Columbia and Ecuador to the northern frontier of Peru. Some 60% of the 3,000 vascular plants in the paramos are endemic and it is the habitat of highly threatened species like the spectacled bear and mountain tapir. Cultural traditions of many Andean communities consider these regions sacred. Moreover, the paramos are critical natural water towers for the whole of the north central and northern Andes, storing and slowly releasing water to the 70% of these nations' populations that live downstream. Modern intrusions such as mining and roads have threatened the paramos in recent years, however; and climate change has led to increased use of these high altitude grasslands by local people for agriculture and livestock grazing.

Andean villagers were determined nevertheless to protect their paramos. A large transboundary Conservation Corridor project was envisaged with support from the GEF. Communities established their own vision and goals, mapped out opportunities and responsibilities, and worked hard to strengthen their skills in everything from farming to ecotourism to public presentations to lowland officials. In some cases, they organized successful collaborations to oppose mining operations that would have imperiled the fragile wetlands, learned new livestock management approaches to improve what they already had, so they stopped moving agriculture upwards into the paramos, and they developed low-impact ecotourism alternatives for added income.

Among the lessons learned are that, .."peoples who have historical and cultural roots inscribed in their landscapes…have a profound wisdom about how to care for the land…Trying to understand the world through the eyes of those who live in the place has supreme importance. Second..when local communities are able to articulate this knowledge (and the values that underlie it) in the language of urban people, then doors to communication open up."*

**Jorge Recharte, "The Paramos of Ayabaca" in Irena Salina (Ed.), Written in Water: Messages of Hope for Earth's Most Precious Resource, National Geographic: Washington, D.C., 2010, pp.217-218.*

projects in the specific cultural contexts of each area. The Great Inca Road program was inspired in part by an exchange of visits by mountain experts working on the Andes and the Appalachian Mountains of the eastern US. The great Appalachian Trail (AT) was conceived as early as 1921, but it took decades of hard work before the it was formally established in 1968 as part of the National Trails System Act, which created a new class within existing public lands, eventually growing to encompass more than 100,000 hectares, and extending more than 3,500 kilometers from Maine to Georgia. In addition to challenging "through hikers" who attempt the entire trail, local sections of the AT serve as hubs for economic development and cultural preservation. While the Appalachian Mountains of the eastern US are one of the oldest ranges on Earth, visitors are often surprised to find they share many characteristics of developing countries: rich culture in the midst of remote, rural poverty.

HandMade in America is a local NGO begun in 1993, founded by residents of North Carolina who realized that the region was home to many craft and folk artists preserving traditions from wood working to musical instrument making. Following a survey of local artisans, the group developed guided craft-heritage trails and guidebooks that have been effective in attracting tourists and helping the craft makers avoid onerous trips to craft fairs to sell their goods.

Today, the programs have expanded to include assistance for women entrepreneurs interested in creating or growing home-based businesses; a small town revitalization program that applies participatory methods to improving the physical and civic infrastructure of local communities; a "Craft Across the Curriculum" collaboration that brings teachers and local craft artists together to continue craft traditions across generations; and a Craft, Architecture and Design program that connects craft artists to home design professionals. Consulting services, workshops and conferences fill out the range of offerings of this organization that is making significant contributions to regional conservation and sustainable livelihoods. (www.handmadeinamerica.org.)

One key to success, highlighted in the foregoing example, is identifying the special characteristics and assets of each region. In Kyrgyzstan, tourists are lodged in traditional yurts, and given opportunities to experience the thrill of hunting small game from horseback with trained eagles. Costa Rica, Mexico, and other countries with mountainous rain forests have discovered the potential of attracting tourists for bird watching, hiking, or the sheer fun of zip-lines. These activities typically are run by private companies, but the best of them involve local community members as guides, or participants in cultural enhancements that are integrated into tours.

Specific elements for Community-Based Mountain Tourism

- integrated management strategies and program design, with natural, cultural, and social components given equal weight with economic benefits.
- Balanced highland-lowland resource flows and decision-making, to ensure that local communities participate actively in decision-making and have incentives for conservation as well as income generation. Such frameworks require supportive policy, legislative and regulatory support
- Integrating local knowledge with external expertise
- Infrastructure development appropriate to fragile mountain environments
- Equitable distribution of ecotourism benefits and opportunities, including reinvesting tourism revenues into conservation
- Capacity building for local organizations, and skill-based training for local people, including full integration of women
- Awareness raising for tourists and local communities alike
- Partnerships, and continuing exchange of experience, ideas, learning and best practice

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Source Jane Pratt 2012

Mountain climbing has been a major windfall for high mountain countries such as Nepal or the Tibet Autonomous Region of China. The payment of large climbing fees generates significant foreign exchange in such cases. Bhutan has enhanced its ecotourism income by limiting the supply: the numbers of visitors is constrained and each tourist is required to sign up with one of the country's certified tour agencies. These agencies coordinate with each other to ensure that facilities are not overcrowded, and everyone shares fairly in the revenue. By 2011, mountain tourism in Bhutan had increased by 56% over the previous year, with 65,746 high-end tourists contributing a minimum daily tariff of USD 250 during peak season, and USD 200 during the low season, totaling almost USD 48 million. Trekking in Nepal, which was almost entirely unregulated for many years, has recently begun to generate more local benefits, as NGOs have helped train local lodge owners in food preparation and hygiene, and use of kerosene and improved stoves to reduce unsustainable harvesting of fuel wood, thus providing income and environmental benefits to local communities. Special programs, again initiated by NGOs, have educated tourists by establishing trekking guidelines that cover everything from fuel use to limits on the size of loads porters may carry. Tourists pay a small charge for tags they hang on their parkas, with large print summarizing the pledge to support sustainable tourism with specific measures.

In all of these and many other cases, community-based tourism is successful when it contributes simultaneously to the conservation of ecosystems and sustainable livelihoods for local people. Some of the lessons learned from several decades of mountain tourism were gleaned from a pioneering e-conference conducted by the Mountain Forum and the Mountain Institute in 1998, and have been validated by subsequent research showing that positive benefits from mountain ecotourism requires a number of specific elements (see box):

Green economy and urbanization in mountains

Status of urbanization in mountain regions

A significant share of the global mountain population lives in towns and cities. Some of these are capitals, including Kathmandu with more than 2 million inhabitants, Quito with 1.5 million, and La Paz, the highest capital in the world at 3,640 meters, with close to 900,000 people. Others are megacities such as Mexico City at 2,240 meters, which has a population of about 8.9 million in the city proper and 21 million in the wider metropolitan area, making it the fifth largest in the world.

Mountains and urban development are often seen as a contradiction. Yet mountain regions such as the Andes, the Hindu Kush-Himalaya, and the Alps have always had regular exchange with the lowlands for essential goods and services,; and people have always moved between these two realms. Quite apart from such interaction, most mountain regions have been settled since prehistoric times and the socialization in compact villages with common rules and institutions has displayed forms of social urbanization.

In global comparison, the rate of urbanization is highest in South America and the Caribbean where 47% of the total mountain population of 53 million lives in towns. For some of the Andean States this proportion is even higher. In the mountains of industrialized countries, 36% of the mountain population or 20 million people live in urban areas. The urbanization rate in Asia and the Pacific is still relatively low but increasing rapidly, presently at 14%. Owing to the large mountain population in that part of the world, this low percentage still represents 46 million people

Urbanization in mountain areas and its issues

As a result of migration from rural areas, towns and cities in most mountain areas continue to grow, but at the same time their development is constrained by the steepness of surrounding land. Those living at the periphery – often the poor – are forced to settle on steep slopes and other marginal lands, where the risks of landslides or floods are greatest. Mountain cities depend largely on resources such as timber and fuelwood from surrounding areas. This leads to deforestation, which in turn increases the risk of landslides and floods. In the absence of adequate sewage systems, waste water from residential and industrial areas is released into rivers, leading to serious pollution that affects the inhabitants of cities and towns, and all those living further downstream.

Moving mountain towns towards a greener economy
Unplanned sprawl and poverty in mountainous urban areas needs to be addressed by urban planning and infrastructure investments. Strengthening local centers as small economic and administrative nodes may facilitate the emergence of locally embedded entrepreneurs and the generation of diversified urban economies, and create new forms of cooperation between different local actors. Although such nodes will be integrated in wider national or even regional and global economies, they may help create specific local value chains. Such mountain-specific polycentric urban development might clear the way to a greener economy by facilitating participatory processes and socio-economic diversity, while averting the risky polarization between consumptive and productive regions.

PART 2

Institutions for sustainable development in mountain regions

"Good governance at the local, national and international levels is perhaps the single most important factor in promoting development and advancing the cause of peace"

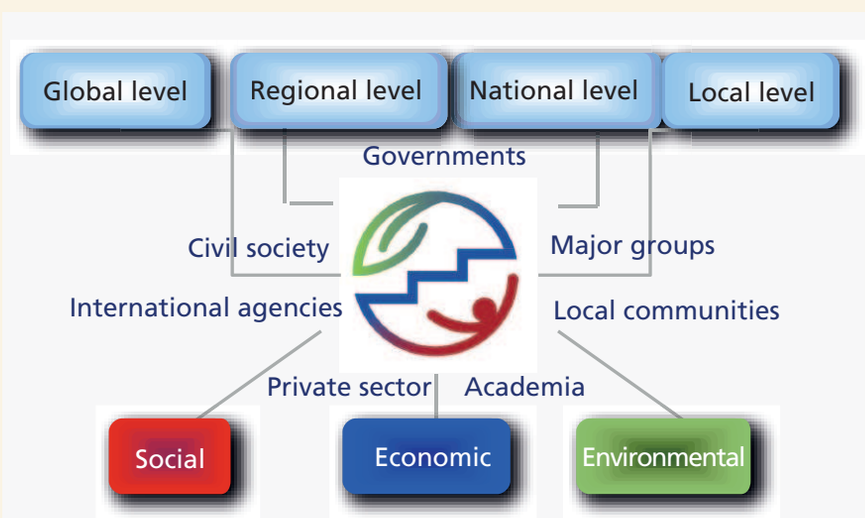
Kofi Annan[1], 2002

Twenty years after 1992 UN Conference for Environment and Development, reform of the institutional framework for sustainable development (IFSD) remains a major challenge on the global agenda. Since the 2002 World Summit on Sustainable Development (WSSD), UN member governments, stakeholder groups, and academics have actively debated perceived shortcomings and proposed improvements.

On the eve of the Rio+20 Conference, there is widespread agreement on the need for various improvements. Current sustainable development institutions should be strengthened at all levels. Treaties, financing, and authority are too fragmented. The three pillars of sustainable development ought to be better integrated in the UN system and in global, regional, and national policies. The science-policy interface must be improved. Lastly, shortcomings in monitoring, data collection and assessment, accountability, and enforcement capabilities need to be addressed.[2] In sum, betterment is required across the entire governance spectrum.

The task ahead is immense, but the wheel need not be reinvented. For several millennia, human societies have demonstrated remarkable ingenuity in crafting institutions for dealing with all kinds of challenges. This is particularly the case in mountain regions, where hazard-prone physical environments often compound political, economic, and social marginalization. Indeed, collaborative problem solving under uncertainty has become a hallmark of mountain institutions. This is reflected, for example, in the widespread existence of common property regimes. In recognition of their special significance, a diverse set of institutions has emerged in support of mountain regions.

IFSD reformers have much to learn from the diversity of mountain institutions. To this end, the following pages present almost thirty examples of such institutions. Although the choice of examples is necessarily selective, it offers a systematic overview of specific achievements and some key challenges that can serve as a source of inspiration for IFSD reform. The examples are organized in sections according to their principal focus of operation – global, regional, national, and local. Each section is introduced by a summary of the overall significance and interlinkages of corresponding institutions.



Institutions that promote sustainable development in mountain regions. (Adapted and modified from: Rio+20 Newsletter Special issue on Institutional Framework for Sustainable Development. Vol 2, Issue 14, 29 July 2011).

Institutions and organizations

Institutions exist in many forms. Although the term is often used as a substitute for organizations, the two are not the same. Institutions are sets of norms and expectations that coordinate the interaction of individuals and groups. Many familiar institutions are formally established: the state, political parties, legislatures, or courts. Other institutions are all around us yet much less visible, including markets and property. No matter their visibility, institutions are important because they embody ideas about how to accomplish goals generally recognized as important in society. In mountain regions, numerous local institutions shape the conservation and sustainable use of natural resources. At the global level, institutions such as international conventions help coordinate efforts that benefit nature and society in mountain regions, and beyond.

Institutions are also useful because they provide stability during times of rapid change. This is crucial for mountain regions, where momentous environmental and socioeconomic changes are afoot as a result of human-induced climate change and the accelerated restructuring of global, regional and local economies. Institutions facilitate the creation, transfer, and use of traditional and new knowledge from one place to another and one generation to the next. In mountain regions, such knowledge has long been a pivotal asset for adaptation, hence institutional failure can have grave consequences.

Organizations, by contrast, are collectivities in pursuit of specific objectives. They typically have staff, different kinds of resources, and offices. Many of the examples presented on the following pages are organizations. They include the International Mountain Partnership (IMP), the Alpine Convention, or the University of Central Asia. These organizations also represent institutions. For instance, the IMP is one among many Type II Partnerships that emerged from the WSSD. As an institution, a Type II Partnership involves a set of norms and expectations about how public and private actors ought to collaborate in the pursuit of sustainable development.

Why does the difference between institutions and organizations matter? Organizations come and (less rarely) go. Institutions and the norms they embody are more long-lived. They are also more difficult to change because change comes about gradually through the repeated application – by individuals and organizations – of new practices. Institutions are influential across an entire range of organizations, especially when they are linked together in an institutional framework. As organizations face new challenges and learn to address new problems, however, lessons learned can become anchored in new *institutional frameworks*. The advantage of focusing reform efforts on institutional frameworks is that their effects are felt far and wide.

Navigating institutional diversity

Mountain regions are highly diverse. Their topological and climatological complexity, as well as their distribution across the globe, have produced a striking range of opportunities and challenges for societies. Because mountain ranges often transcend state borders, it is not unusual that mountains are shaped by different political traditions and ambitions. Natural and social heterogeneity also combine with a multitude of cultural and symbolic meanings of mountains. The result is a fertile ground for institutional and organizational diversity.

The examples of institutions and mountain organizations in this report can be distinguished by three features: the makeup of their constituency, the comprehensiveness of goals and objectives, and the reach of operations.

Constituency
Many institutions have a highly public character because the problems they seek to address involve public goods and services – clean air and water, knowledge and education, security. For this reason, constituency primarily consists of public actors, such as states that are signatories to the Convention on Biological Diversity or the Carpathian Convention. Others are strictly private and deal with land ownership or the manufacturing and sale of products. Conservation land trusts work with private property owners to preclude commercial development of sensitive watersheds in return for tax advantages. Between the public and private exist countless combinations. The International Mountain Partnership unites public and private actors. Local resource user groups manage public goods such forest ecosystem services in Nepal but also operate as private actors in timber markets. Constituency makeup matters for institutions and organizations because it concerns directly to the range of knowledge and experiences that can be mobilized.

Goals
Sustainable development is the balanced consideration of the economic, environmental, and social aspects of well-being for current and future generations. Many institutions enable such balanced consideration and many organizations designate it as their overarching goal. Examples include the Consortium for Sustainable Development in the Andean Ecoregion (Condesan), the Sierra Nevada Conservancy, and numerous national mountain policies around the world. However, not all components of the institutional framework for sustainable devel-

opment currently relate to such a broad mandate. International treaties often specialize in one aspect, such as trade in endangered species or transboundary water management. Nor do all organizations focus their work on each aspect of sustainable development. Instead, many pursue specialized goals. The University of Central Asia is active in education and training. Payment for ecosystem service (PES) schemes in Costa Rica relate almost exclusively to forests. The mountain institutions and organizations presented in the following pages show that effective work has emerged from comprehensive as well as specialized orientations.

Operational reach

The third feature that distinguishes institutions and related organizations concerns the reach of operations. Numerous institutions have clearly delimited political jurisdictions. Most institutions that are tied to states are included in this category. Even where states have specific mountain policies, mountain regions are often delimited on the basis of subnational entities (provinces, counties, regions, cantons). For other institutions, the primary reference is not jurisdictional but ecoregional. A mountain range can be the overarching referent, but mountains are also home to so-called functional regions: watersheds, metropolitan systems, protected areas, or linguistic regions. Such delineations always emerge from social processes. As such they are often subject to debate. This is one reason why attention to the operational reach of institutions and organizations is significant. Where functional regions overlap with established jurisdictions, multiple institutions come into contact. The result can be a synergy or conflict. A transboundary institution such as the Andean community of Nations can raise awareness of issues best addressed collectively. But overlap can also have negative consequences, for instance where ethnic groups are marginalized because their mountainous origin is split by state boundaries.

Institutions and organizations found in mountain regions combine these features in countless ways, from local to global levels. The resulting diversity is an important asset for a number of reasons. When similar problems are addressed in different institutional and organizational contexts, various problem-solving approaches emerge. Similarly, learning processes are accelerated when effective solutions can be identified and transferred. In this respect, organizations such as Condesan, International Centre for Integrated Mountain Development (ICIMOD), and the Mountain Research Initative (MRI) have developed significant expertise.

Linking across levels

The examples presented in this report are testimony to the rich and diverse institutional landscape that has evolved in and around mountains. Most of these institutions and organizations focus on the local, national, regional, or global level. However, mountain institutions and organizations have also developed extensive links across these levels. The International Mountain Partnership primarily works through regional initiatives. regional mountain institutions and initiatives in the Alps, Caucasus, Central Asia are linked to national levels through state public administration officials, and to local levels via networks of municipalities. Conversely, local level institutions are often linked to actors at the regional and global levels through development assistance and the implementation of international treaties.

This linkages serve many purposes, including information exchange, knowledge diffusion, collective learning, resource mobilization and sharing, and policy development. With the growing recognition that multilevel governance arrangements are imperative for sustainable development, mountain institutions and organizations are well placed to make a significant contribution to the post Rio+20 sustainable development agenda. The following pages offer a glimpse of the diversity of efforts in and for mountain regions.

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[1] Kofi Annan, former Secretary General of the United Nations, commenting on the Johannesburg Plan of Implementation.

[2] Numerous IFSD analyses and proposals can be found at www.uncsd2012.org/rio20/publicationsifsd.html.

Institutions working at the global level

At the 1992 United Nations Conference on Environment and Development (UNCED), mountains were for the first time recognized as a global priority for collective and coordinated public action in the interest of nature conservation and sustainable development. Natural scientists had suggested their special relevance since the turn of the nineteenth century, yet mountains were absent from global governance deliberations until UNCED attendees devoted a special Agenda 21 chapter to their plight (Chapter 13, "Managing Fragile Ecosystems: Sustainable Mountain Development"). Ten years later, the importance of mountains was confirmed in the World Summit on Sustainable Development (WSSD) Plan of Implementation. It noted that "[m]ountain ecosystems support particular livelihoods and include significant watershed resources, biological diversity and unique flora and fauna" and that "[m]any are particularly fragile and vulnerable to the adverse effects of climate change and need specific protection" (Article 42). Also in 2002, the organization of an International Year of Mountains (IYM) made a significant contribution to worldwide awareness of the importance and contribution of mountain regions to global diversity.

During the two decades since UNCED, the 'globalization of mountain issues' co-evolved with rising global concerns for climate change and biodiversity loss, global initiatives for poverty alleviation, and efforts to recognize cultural minority rights. The world's numerous mountain regions and societies appeared to be both unique and sharing a common need to address these predicaments. For this reason, mountains have been singled out in international treaties such as the Convention on Biological Diversity (1992, see case study CBD), and in global research programs (see case study Mountain Research Initiative). Following the 2002 WSSD, a global partnership for mountains (see case study Mountain Partnership) was created to mobilize actors in support of global governance for a wide array of thematic issues more or less specific to mountain regions. The ascent of the global level in the framing of mountain issues has also generated initiatives by mountain people themselves. The World Mountain Population Association (see case study WMPA) was created in 2002 to offer people from mountainous areas the opportunity to make their own voices heard and to be represented in international conferences.

Participants in the globalization of the mountain agenda have always emphasized that knowledge and governance should also be organized at all levels. Indeed, the diversity of natural and human conditions in mountain areas and the heterogeneous status of mountain regions in national contexts and policies has required that global awareness and action be combined with the development of local, national, and regional initiatives.

Accordingly, the Mountain Partnership (see case study) and the Mountain Research Initiative have developed regional approaches to better account for the specificity of regional circumstances. IYM and WMPA activities largely focused on the national level in order to reach and involve states more effectively. In some cases, global initiatives related to mountain issues consist of networking among local or regional institutions: some decades after having created the first biosphere reserves, UNESCO developed a specific project for connecting Mountain Biosphere Reserves (see case study) in a network aimed at optimizing the exchange of knowledge and experiences, and at transferring scientific knowledge into policy. The heterogeneity of mountain regions is a key resource in a time of unanimously celebrated biological and cultural diversity. Any attempt to globalize issues and institutions has to take this heterogeneity into account. At times, the staggering diversity makes it difficult to design instruments at the global level. During the last few years, interested parties periodically discussed the possibility of promoting an international convention for sustainable mountain development SMD, especially during the 2010 Global Change and the World's Mountains Conference in Perth, Scotland. To this day, however, the proposal has faced an uphill struggle against the high diversity of regional and national contexts.

Mountain Partnership

A global instrument for multi-stakeholder cooperation

The Mountain Partnership (MP) is one of the most important outputs of the sustainable mountain development agenda between the 1992 United Nations Conference on Environment and Development in Rio de Janeiro and the 2002 World Summit on Sustainable Development in Johannesburg (WSSD). Emerging ten years after the adoption of Chapter 13 of Agenda 21 (the mountain chapter), the MP is one of many so-called Type II partnerships developed at WSSD. It aims to enhance stakeholder collaboration in a variety of thematic and regional sustainable development agendas. The Food and Agriculture Organization of the United Nations (FAO), Italy, and Switzerland have provided substantial funding; FAO hosts the MP Secretariat.

The Mountain Partnership comprised about 40 members when it was first launched in 2002, and has grown to 180 members in May 2012. Its members consist of different types of actors, including states, intergovernmental organizations, major groups (e.g. civil society, non-governmental organizations,

private sector), and research centers. With the financial support of its donors, two Global Meetings were held in Italy (2003) and Peru (2004); the third will be held on the sidelines of the Rio+20 Summit. These meetings were instrumental in setting priorities and in defining the modus operandi of the alliance.

In the following years, the MP prioritized a regional focus leading to the establishment of decentralized hubs for mobilizing existing actors and networks and for providing services and support to members at the regional level. Important regional and international organizations have developed strong ties with the Mountain Partnership, benefiting from political and technical support as well as knowledge exchange. At the international level, mountains have been represented at high-level meetings and events during the Conferences of Parties of the three Rio Conventions (biodiversity, climate change, and desertification), in deliberations of the UN Commission for Sustainable Development, and at other global events such as the World Forestry Congress and major FAO conferences. An open dialogue is maintained between the Secretariat and MP members.

In 2011, the World Bank – also a member – financed the MP Secretariat to promote a better understanding of climate change impacts in mountainous countries. In the run-up to the Rio+20 Summit, the Secretariat has actively mobilized its members to ensure that mountains are represented in the summit documents, and the MP joined the organizing committee of the Rio+20 Mountain Pavilion, where answers that mountains can provide to the challenges of our times are showcased. As part of an overall restructuring exercise, MP is now seeking to make collaboration more coherent, coordinated and synergistic.

Further information
Mountain Partnership – www.mountainpartnership.org

Mountain Forum

The first NGO consultation on the Earth Summit's Mountain Agenda took place in Peru in 1994, producing a list of priorities and establishing strong connections among organizations and individuals working on and in mountains. Recognizing an urgent need to continue the dialogue, the 110 participants decided to create a Mountain Forum (MF) to promote conservation and sustainable development in the world's mountains. An organizing committee met the following year to establish a forum for mutual support and for the exchange of ideas and best practices. With the support of the Swiss Agency for Development and Cooperation and Food and Agriculture Organization of the United Nations, a secretariat and five regional nodes were established (Africa, Asia, Europe, Latin America, and North America), with initial responsibilities shared among the Mountain Institute, the International Centre for Integrated Mountain Development, and the Consorcio para el Desarrollo Sostenible de la Ecoregión Andina. Some regional nodes later created sub-regional nodes to accommodate multiple linguistic groups.

The Mountain Forum's vision is to be an innovative and integrative bridge between diverse organizations and individuals that will empower all participants to raise mountain issues at local, national, regional, and international levels, and promote policies and actions for equitable and ecologically sustainable mountain development.

From a small core, MF has grown to over 7,600 individual members working in almost every mountain range in the world, and over 200 institutional or organizational members that share MF information among their own large group of scientists, policy makers, practitioners, technical and other staff. Today, the MF provides connections through its large base of users. Joining is free, but users must consent to abide by agreed behavioral norms for electronic communications.

Among other services, MF pursues its goals through:
- promoting membership and user data bases, and raising funds to support the network;
- electronic and traditional exchange of information and best practice, responding to priorities of users;
- conducting periodic e-conferences on issues of interest to users; and
- maintaining a digital repository, or on-line library of mountain publications, including grey literature.

The Mountain Forum's active and successful networking provides timely information about upcoming events, grant opportunities, scientific developments, current news and events, and serves as a resource for practitioners.

Further information
Mountain Forum – www.mtnforum.org

Convention on Biological Diversity

Promoting the conservation and sustainable use of mountain biodiversity

The 1992 Convention on Biological Diversity (CBD) is an international treaty with three main goals: conservation of biodiversity, sustainable use of biodiversity, and fair and equitable sharing of the benefits arising from the use of genetic resources. Mountains are specifically mentioned in Article 20 of the Convention. It 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." Since mountains are cross-cutting in nature – they contain forests, dry and sub-humid lands, inland waters, agricultural biodiversity, some are on islands or in protected areas – all other articles of the Convention and many Decisions of the Parties apply to mountain biological diversity.

In its eight and ninth meetings, the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) considered the status, trends, and threats to mountain biological diversity, as well as measures for the conservation and sustainable use of mountain biological diversity. It proposed the structure, elements, and goals of a work programme on mountains. The Programme of Work on Mountain Biological Diversity was adopted by the Conference of Parties in 2004 (Decision VII/27).

The implementation of the Programme of Work aims to make a significant contribution to poverty alleviation in mountain ecosystems and in lowlands that depend on the goods and services produced in mountain ecosystems, thereby contributing to the objectives of the Strategic Plan of the Convention on Biological Diversity, the Plan of Implementation of the World Summit on Sustainable Development, and the Millennium Development Goals.

The Programme of Work is intended to assist Parties in establishing national programmes of work with targeted goals, objectives, and actions, with specific actors, time frames, inputs, and expected measurable outputs. It consists of three interlinked elements – direct actions, means of implementation, and supporting actions – and focuses on addressing characteristics and problems that are specific to mountain biological diversity:

- The particularly high concentration of biodiversity hotspots in mountain regions;
- Cultural diversity and the key role of indigenous and local communities in the conservation and management of mountain biological diversity;
- The fragility of mountain ecosystems and species and their vulnerability to human and natural disturbances; and
- The upland-lowland interactions that characterize mountain ecosystems.

In 2010, Parties to the CBD adopted the Strategic Plan for Biodiversity 2011–2020, a ten-year framework for action by all countries and stakeholders to safeguard biodiversity and the benefits it provides to people. The Strategic Plan confirms mountain biodiversity as the focus of one seven thematic programmes of work.

Further information

Convention on Biological Diversity – www.cbd.int

UNESCO Mountain Biosphere Reserves

Mobilizing local assets to tackle global issues

The United Nations Educational, Scientific and Cultural Organization (UNESCO) launched the Man and the Biosphere (MAB) in 1971. As an Intergovernmental Scientific Programme, the MAB promotes interdisciplinary approaches to the conservation and rational use of natural resources. An essential feature of the programme is the creation of UNESCO Biosphere Reserves, where conservation and sustainability strategies are implemented. In 1977, a World Network of Biosphere Reserves was created to encourage cooperation through the exchange of experiences.

Mountains are the focus of one of the MAB programme's eight ecosystem and theme-specific networks. In 1973 a specific sub-program was established to address the impact of human activities on mountain and tundra ecosystems (MAB-6). This interdisciplinary research program fostered the organization of science devoted to mountains at the global level. Additionally, UNESCO has assisted in the development of international expertise on mountains through support to research programs, conferences, publications, and two university chairs in sustainable mountain development (University of Highlands and Islands, Scotland; International University of Kyrgyzstan, Kyrgyzstan). A key outcome of the UNESCO support to mountain issues has been the drafting of the Global Change in Mountain Regions research strategy (See Mountain Research Initiative case study).

After decades of focusing on conservation, the MAB mountain program has recently begun to address global environmental change, especially human-induced climate change. Mountain Biosphere Reserves are used as study and monitoring sites to assess the impacts of these changes on mountain ecosystems. This a good illustration of the cumulative knowledge gained locally in the MAB Reserves to tackle global issues. For instance, UNESCO launched a research program to develop adaptation strategies to global climate change in mountain Biosphere Reserves.

Further information
UNESCO Biospheres – www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/

World Mountain People Association

Bringing the voice of mountain people on global arenas?

The rise of mountain issues at the global level since the early 1990s has been widely fueled by the intention of many to improve the living conditions of people in mountain regions. Some NGOs such as the Panos Institute and some IGOs such as the FAO have been especially active in domains as different as the collection of cultural testimonies, the recognition of traditional ecological knowledge in mountain forest management, and the diffusion of improved models of domestic furnaces.

For some actors, however, the mere mentioning of mountain people's needs and expectations in a global mountain agenda was not enough. An alternative was to become active participants in the decision-making process and to build political institutions liable to be recognized by other institutions.

This took place in many contexts at the local (thanks to democratic and decentralized process of consultation and decision-making in many countries) and regional levels (see case study Alpine Convention). National associations of politicians elected in mountain regions have been created throughout the twentieth century, first in Western Europe (see case studies Switzerland, France) and later in many other regions. At the end of the 1990s, some of these national associations launched a World Mountain People Association (WMPA), officially created in 2002 during a global meeting held in Quito. It was aiming at lobbying and ensuring a presence representatives of mountain regions in global conferences and institutions devoted to mountains.

The WMPA has developed national sister associations, such as WMPA Morocco or WMPA Madagascar, to optimize its capacity for reaching national administrations and governments. It organizes regional workshops when specific issues (illegal crops in Mediterranean mountains, labelling of mountain products in the Himalayas, etc.) are of common interest to communities in different countries. From time to time, local and national representatives gather in global meetings to facilitate the exchange of knowledge and experiences.

The WMPA is certainly not as strong as many global NGOs, or as numerous as some indigenous confederations. Its annual budget is modest and its capacity to develop a worldwide network is, presently, limited. However, it illustrates the persistent need to challenge and improve inadequate political representation of so-called mountain people.

Further information
World Mountain People Association – www.mountainpeople.org

Mountain Journals

The institutional framework for sustainable mountain development has benefited significantly from scientific insights, and scientific journals are one of the principal venues through which new knowledge is communicated.

Revue de Géographie Alpine / Journal of Alpine Research

The Revue de Géographie Alpine / Journal of Alpine Research (RGA) was founded in 1913 by the Fench geographer Raoul Blanchard. Since 1968, it has been managed by the Association of Alpine Geography at the University Joseph Fourrier in Grenoble, France. The RGA is an international, multidisciplinary, and bilingual (French-English) journal that publishes scientific papers on regional and environmental problems concerning the Alpine Arc and European mountain areas; comparative analyses relating to other mountain areas of the world are frequently included in special thematic issues.

Mountain Research and Development

Founded in 1981 by Jack Ives, Mountain Research and Development (MRD) was part of pioneer efforts to foreground mountains on the world's sustainable development agenda. In 2000 MRD was handed over to Hans Hurni (University of Bern). An enhanced concept brought together research and development. Since 2009, MRD is fully peer-reviewed and

open access, with a 5-year impact factor for 2010 of 0.833 (2-year: 0.476) and a worldwide audience from over 120 countries. Many authors are from the global South. MRD's International Editorial Board and extensive editorial services guarantee top-quality articles cited by high-ranking journals. Focus Issues take up emerging sustainable development themes.

Journal of Mountain Science

The Journal of Mountain Science (JMS) was started in 2004 as an international English-language journal on mountain sciences that introduces mountain research achievements of developing countries to interested parties worldwide. It publishes research and technical papers on mountain environment, mountain ecology, mountain hazards, mountain resources and mountain development. The bimonthly JMS is supervised by the Chinese Academy of Sciences and sponsored by the Chengdu Institute of Mountain Hazards and Environment. The journal's editorial board and reviewers represent some 18 countries and regions on five continents; the United Nations University participates in the editorial work and supports subscriptions for institutions in developing and transition countries.

eco.mont

The Journal on Protected Mountain Areas Research and Management (eco.mont) publishes peer-reviewed articles on research within protected mountain areas and its potential interest for protected area management; its geographic focus is on Alpine Protected Areas and on other European (or global) mountain protected areas. Since 2009, eco.mont has been published twice a year and each issue also includes reports on management issues and showcases one protected area. The journal's editorial board consists of the members of the ISCAR-Working Group "Protected Area Research."

Further information

Revue de Géographie Alpine / Journal of Alpine Research – rga.revues.org

Mountain Research and Development – www.y2y.net

Journal of Mountain Science – www.springer.com/earth+sciences+and+geography/journal/11629

Eco.mont – www.oeaw.ac.at/ecomont

Mountain Research Initiative

Networking mountain scientists and policy makers around the world

The Mountain Research Initiative (MRI) is a global scientific promotion and coordination effort that recognizes the importance of dialogue between science and policy. MRI emerged during preparations for the 2002 International Year of Mountains, when three international research programmes (IGBP, IHDP and GTOS) proposed a joint initiative to "achieve an integrated approach for observing, modeling and investigating Global Change phenomena and processes in mountain regions, including the impacts of these changes and of human activities on mountain ecosystems."

The Initiative's governance structure consists of a Scientific Advisory Board (SAB) and a Coordinating Office with an Executive Director. Additionally, the MRI Global Commission (the SAB augmented with leading researchers) meets periodically to discuss the strategic direction of mountain research community and suggest ways for MRI to support corresponding efforts. Since 2007, MRI's Coordination Office has been hosted by the Institute of Geography at the University of Bern, Switzerland.

The MRI's vision is a global change scientific program that detects signals of global environmental change in mountain environments; defines the consequences of global environmental change for mountain regions and lowland systems dependent on mountain resources; and informs sustainable land, water, and resource management for mountain regions at local to regional scales.

These goals are pursued through four types of action at global and regional levels:

- initiating the formation of networks of researchers, engaging organizations with the issues, and developing research activities;
- implementing actions that enhance the profile of global change research in mountain regions and otherwise help networks implement that research;
- integrating and synthesizing the results of research; and
- informing stakeholders of the nature and implications

MRI's commitment to facilitating science-policy dialogue is evident from its extensive networking promotion. The recent project "Mountain Sustainability: Transforming research into practice" (MountainTRIP) translated scientific results into guidance for practitioners of sustainable mountain development in Europe. Numerous "Key Contact Workshops" held at scientific conferences provide targeted opportunities for exchanging information and initiating interdisciplinary collaboration. Finally, the MRI maintains an extensive multimedia archive of written resources, video presentations, and project briefs.

Further information

Mountain Research Initiative (MRI) – mri.scnatweb.ch

Institutions working at the regional level

For the last two decades, major UN conferences, commissions, and agencies have promoted mountains as a major asset for global biodiversity, cultural, and landscape diversity. However, countless differences among mountain ranges at various latitudes have imposed the need for regional approaches, especially in terms of political institutions for coordinating environmental management and sustainable development strategies.

According to Chapter 13 of Agenda 21, there is a commitment "[t]o improve coordination of regional efforts to protect fragile mountain ecosystems through the consideration of appropriate mechanisms, including regional legal and other instruments" (Paragraph 5.e). The Mountain Partnership, soon after its creation at WSSD in Johannesburg (2002), focused most of its initiatives on regional events and projects. It is now becoming clear that if global arenas and events can fruitfully raise awareness for mountain issues and explain how the globe owes a lot to mountain environments and societies, a broad range of challenges need to be addressed at the regional and transnational level. Tellingly, it has become commonplace to refer to mountain issues in the context of ecoregions (ranges, cordilleras, massifs, etc.) and transboundary cooperation, many international borders having been drawn with reference to mountains.

Institutional arrangements at the regional level are numerous, even though there are only two transboundary international conventions to date: the Alpine Convention and the Carpathian Convention (see case studies). Committing several states and the European Commission (in the case of the Alpine Convention) to deal with many different issues and overarching sustainable development strategies, these treaties are probably the most ambitious institutions for mountain regions in the world. This explains that discussions to pursue similar initiatives elsewhere have been or are presently undertaken, including the Altai, Balkan Mountains, Caucasus, and Dinaric Arc. A Central Asia Mountain Charter was also signed in 2002 by Kyrgyzstan, Tajikistan and Kazakhstan.

Where international treaties have been difficult to negotiate or are poorly adapted to the circumstances, other kinds of institutions are implementing programs and projects at the regional level. Among these, ICIMOD in the Himalayas and CONDESAN in the Andes (see case studies) are well-known centers devoted to transnational coordination in applied research on mountain issues. In Europe, several types of institutions – INTERREG regional frameworks, Euroregions, European Grouping of Territorial Cooperation setups, transboundary working groups (Pyrenees, Jura) have actively promoted transboundary cooperation. Finally, mountain issues are periodically addressed under the auspices of regional economic integration organizations such as the Andean Community of Nations (see case study) and the Association of Southeast Asian Nations.

Regional governance for sustainable mountain development need not always be intergovernmental. Indeed, many regional initiatives are implemented by non-state actors. Some of these, including the Yellowstone to Yukon corridor (see case study), are ecoregional initiatives established by environmental organizations seeking to improve connectivity among protected areas in large mountain ecosystems. Others primarily focus on social issues. The Aga Khan foundation is presently funding the creation of a tristate university in Central Asia, with a focus on specialized training in environmental management, social development, and health care (see case study).

The institutional framework for sustainable mountain development has a very strong regional dimension, with numerous active institutions and organizations. The diversity of their structure, legal status, and set of stakeholders demonstrates that a wide array of models is already available. Such models can facilitate the building of new initiatives, in mountain areas and elsewhere.

Andean Community of Nations

Embracing mountains in the context of regional economic integration

The Andean Community of Nations (CAN; previously known as Andean Pact or Andean Group) was created in 1969 by Bolivia, Chile, Colombia, Ecuador and Peru to jointly improve the living standards of their populations through integration and economic and social cooperation. Although the 8,000 km long Andes mountains serve as the nominal reference point for this regional agreement, some parts of the range are not included (Chile withdrew in 1976, Venezuela in 2006).

During its early history, the Andean Group created sub-regional customs and trade agreements and established a several common institutions. Since 1983 Community decisions, agreements, and legislation have been directly applicable in member states. The 1990s witnessed the formation of a free trade area, as well as efforts to expand and integrate the social, economic, cultural, environmental, and political spheres in CAN's areas of action. This integrality is the main characteristic of the Andean Community

and has permitted, among other achievements, the free movement of citizens and the development of a supranational legal system.

Although the perimeters of the Andean Community are defined by the nation state borders of its members, the mountain range they share has been the subject of specific attention for many decades. Already in the 1980s, several international organizations joined the Andean Pact in an initiative on the management and development of freshwater basins in high mountains. The institutional framework for supporting sustainable mountain development evolved with the creation of the Andean Committee of Environmental Authorities in 1998 and the Council of Environmental Ministers in 2004. In 2002 CAN approved the Regional Biodiversity Strategy for the Tropical Andean Countries, the first of its type to be adopted by countries that are individually signatories of the Convention on Biological Diversity. Four years later, the Council of Environmental Ministers adopted a five-year Andean Environmental Agenda. The Andean Community's initiatives are of significance both to the continent in general and to the mountain range in particular. Many undertakings make direct reference to the economic, social, and environmental assets of the mountains, including the Strategy for Disaster Prevention and Relief, the establishment of a Consultative Council of the Andean Community Indigenous Peoples, and the Andean Charter for the Promotion and Protection of Human Rights. Many projects with international partners have focused on specific mountain challenges, such as a recent undertaking to monitor and adapt to the retreat of glaciers.

The Andean Community is an important illustration of sustainable mountain development. Compared to other regional mountain initiatives, CAN's activities have focused much more on socioeconomic development than environmental protection. Corresponding initiatives have also typically spanned highlands and lowlands, often emphasizing the interdependency of the two. In spite of direct applicability, however, implementing CAN norms at the national level and securing the political will for regional integration remains a significant challenge.

Further information

Andean Community of Nations – www.comunidadandina.org/endex.htm

CONDESAN

Linking research, practice, and policy throughout the Andes

The Consorcio para el Desarrollo Sostenible de la Ecoregión Andina (CONDESAN) has made invaluable contributions to sustainable mountain development for nearly two decades. The organization was created in 1992 as a partnership of groups promoted by the International Potato Center and the International Development Research Centre. Three years later, CONDESAN became an ecoregional program of Consultative Group on International Agricultural Research. Since 2009, CONDESAN is an independent organization that serves as a regional platform for research for development. Headquartered in Lima, Peru, it is governed by a General Assembly of international associates and an Executive Director.

CONDESAN's institutional history reflects the importance of resilience and adaptation in mountain areas. With the support of international partners, the organization initially focused on linking researchers, development practitioners, and stakeholders, and to identify appropriate means for promoting the development of Andean agro ecosystems. Over time, CONDESAN's mission and institutional structure turned to mobilizing the wealth of the Andes in order to overcome poverty and social exclusion. In the process, the organization faced difficult challenges related to the international funding environment and regional and subnational polarization.

Today, CONDESAN's objectives are to generate and share information and knowledge concerning sustainable development and environmental management in Andean rural societies; to promote policy dialogues with local actors, national governments, and regional organizations; and to strengthen Andean human and institutional capital in order to promote new leaders for sustainable development. CONDESAN works in seven regional initiatives, involving 100 diverse organizations in all nearly all countries of the Andean region.

Through its work, CONDESAN has obtained a reputation for providing spaces for reflection and consultation among Andean stakeholders; generating and positioning regional views of the cross-cutting challenges in environmental management on the public agenda; and contributing to concrete political change (e.g. territorial planning in Cajamarca, water rights laws in Bolivia, or the conservation of Paramo in Colombia, Ecuador, Peru). Some of its activities are internationally renowned. InfoAndina, created in 1996, has been recognized by international organizations as a leader in the management of information on sustainable development in the Andes.

Like many organizations of its type, CONDESAN is well connected. It is a member of the Mountain Partnership, the Mountain Forum, and the International Mountain Society. It also represents the Mountain Forum and the Mountain Partnership Secretariat in Latin America, coordinates the CGIAR Challenge Program on Water and Food in the Andes, and acts as the focal point for the FAO Sustainable Agriculture and Rural Development in Mountains program.

Further information

Consorcio para el Desarrollo Sostenible de la Ecoregión Andina (CONDESAN) – www.condesan.org

International Centre for Integrated Mountain Development

Serving the countries of the Hindu Kush Himalayan region

Concerns for environmental degradation and the resulting ecological and economic problems in the Himalayas led to the establishment of the International Centre for Integrated Mountain Development (ICIMOD) in 1983. It was founded through an agreement between UNESCO and the Government of Nepal and with funding assistance from Switzerland and Germany. The establishment charter was later endorsed by seven additional countries – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, and Pakistan. Today ICIMOD is one of the largest intergovernmental organizations with a regional focus and global outreach on environment and development research and knowledge sharing. It has more than 150 staff at its Kathmandu headquarters and a strong partnership with its eight member countries.

ICIMOD has emerged as the first international organization to focus on the complex and multiple problems facing the mountain areas in the Hindu Kush Himalayan region. With a mandate to provide scientific and technical advice and backstopping to its members, ICIMOD assumed a central role in the region. It promotes the mountain agenda regionally and globally, facilitates regional cooperation through knowledge exchange, enables information and data sharing on new and emerging aspects of mountain environment conservation and management, and helps reduce scientific uncertainties and gaps. ICIMOD has supported cross-country learning in adapting to and mitigating against climate change effects, accessing and adapting global knowledge to regional needs, and building strategic partnerships within and beyond the region.

ICIMOD owes its position within the region to four factors. First, congruity between the strategies, approaches, and activities of the Centre and those of member countries increases the quality and frequency of interaction and leads to meaningful joint decisions and actions. Second, ICIMOD strengthens regional collaboration through the implementation of regional programs, for example in addressing climate change impacts in river basins, ecotourism, and landscape conservation. Third, it has helped improve regional data and information sharing, and promoted the required information and communication technologies. Lastly, ICIMOD has benefited from the fact that globalization and climate change have increased awareness of the key role mountains play in the provision of ecosystem goods and services beyond mountain regions, especially water.

Several important lessons characterize ICIMOD's evolution. Regional ownership of ICIMOD programme needs to increase because member countries carry out an increasing number of similar tasks, many of which are initiated by the same international donors, scientists, and development practitioners who are also associated with ICIMOD. As knowledge solutions developed by ICIMOD have to be useful for solving the problems faced by its member countries, the organization has to shift its focus from the delivery of routine project outputs to strategic and policy-related products and move from a technocentric to a people-centric approach. To this end, the Centre is becoming a regional think-tank for mountain development and environmental issues and has been broadening its partnership and deepening its impacts.

Further information

ICIMOD – www.icimod.org

Alpine Convention

A network of multilevel networks

The Alpine Convention (AC) is an international treaty on the protection and sustainable development of the European Alps. It was signed in 1991, entered into force in 1995, and counts eight Alpine countries and the European Union among its Parties. The project of creating a regional political institution at the level of the Alps began in 1952, when national representatives of nature protection and mountaineering organizations and the International Union for Conservation of Nature, founded the International Commission for the Protection of the Alps (CIPRA) to promote the protection of the range under a

single institution. CIPRA was thus one of the first organizations to introduce an ecosystemic approach at the level of a mountain range and to mobilize Alpine states for the international project. As the first international treaty for a mountain region, the Alpine Convention has become a source of inspiration for many other regional initiatives (see case study Carpathian Convention).

The initial decade of the treaty's existence saw the development of thematic protocols on spatial planning and sustainable development, conservation of nature and countryside, mountain farming, mountain forests, tourism, energy, soil, and transport, as well as a protocol on conflict resolution. The protocols provide common guidance for public policies in the Alps.

During the last ten years, the Parties to the Convention have focused on implementation. A Permanent Secretariat was established in Innsbruck (Austria) and Bolzano (Italy), and a Compliance Committee was set up to periodically review progress in applying the framework convention and protocols. More recently, the Alpine Convention began to address new challenges by means of non-binding Ministerial declarations (population and culture, climate change), ad hoc working groups (e.g. transport, demography and employment) and platforms (e.g. water management, large carnivores), guidelines (e.g. use of small hydropower), and the production of scientific reports (e.g. sustainable rural development and innovation). Despite its achievements as a pioneer in regional mountain cooperation, drawbacks have also been identified and consequently a broad discussion on how to improve the effectiveness of the Alpine Convention was recently launched. This refers in particular to the level of implementation of the protocols, the involvement of regional and local stakeholders and the scope of the policies beyond the environmental dimension. At the same time, it should not be forgotten that the Alpine Convention has been developing significant transnational territorial policies. It has also fostered several networks of stakeholders that anchor the AC's spirit in constituents' daily activities, including a network of scientists representing national or subnational academic institutions (International Scientific Committee on Research in the Alps); the Alpine Network of Protected Areas; the Club Arc Alpin, founded by national Alpine Clubs to coordinate action at the level of the range; and networks of municipalities and other parties (Alliance in the Alps, Alpine Town of the Year, Pearls of the Alps) that promote sustainable development and showcase good practices in their localities. The rise of these Alpine networks has lent substance to the idea that the Alps are becoming a political entity of a new kind. This entity is empowering a wide range of actors, some of them professing to be driven by a common "alpine identity."

Further information
Alpine Convention – www.alpconv.org

Edited by CDE University of Bern, based on contributions by University of Geneva and Permanent Secretariat of the Alpine Convention.

Carpathian Convention

Adapting from Alpine experience

The Carpathians are the second-longest mountain range in Europe, extending 1,500 kilometers across seven Central and Eastern European States (Czech Republic, Hungary, Poland, Romania, Serbia, Slovak Republic, Ukraine). The first step in the institutionalization of a Carpathian regional entity was taken at the Summit on Environment and Sustainable Development in the Carpathian and Danube region in Bucharest in 2001. Organized by the Romanian government in cooperation with the WWF Danube-Carpathian Programme Office (DCPO), fourteen representatives of governments from the region attended the Summit alongside numerous international organizations and the European Commission. The Carpathian countries adopted the 'Declaration on Environment and Sustainable Development' in the Carpathian-Danube region, which encouraged and supported "activities for developing new intergovernmental regional instruments for conservation and sustainable development in the Carpathian region." The Carpathian dimension significantly benefited from the Carpathian Ecoregion Initiative, which WWF-DCPO established in 1998 as a partnership of 18 environmental organizations that produced the first pan-Carpathian vision.

Soon after the Bucharest Summit, the government of Ukraine officially requested that the Regional Office for Europe of the United Nations Environmental Programme (UNEP/ROE) facilitate an intergovernmental process of regional cooperation towards the protection and sustainable development of the Carpathian region. Hoping to benefit from the experiences of the Alpine Convention process, support was requested from the Italian Presidency of the Alpine Convention.

In May 2003, the environment ministers of the seven Carpathian countries signed the Convention on the Protection and Sustainable Development of the Carpathians (Carpathian Convention) in Kiyv, Ukraine. The Convention "provides the framework for cooperation and multi-sectoral policy coordination, a platform for joint strategies for sustainable

development, and a forum for dialogue between all stakeholders involved." The Framework Convention defines general objectives and is implemented through thematic protocols. One of these has already entered into force (Protocol on Conservation and Sustainable Use of Biological and Landscape Diversity), while two more were signed during the Third Conference of the Parties in Bratislava, 2011 (Protocol on Sustainable Tourism, Protocol on Sustainable Forest Management).

Since the signing of the Convention, numerous pan-Carpathian projects have been launched. To this end, the Interim Secretariat of the Carpathian Convention, hosted by the United Nations Environment Programme (UNEP) has played a central role. Concrete outcomes to date include the establishment of the Carpathian Network of Protected Areas (2006), the Carpathian Environmental Outlook (2007), the Carpathian Wetland Initiative (2007), and the formulation of "Visions and Strategies in the Carpathian Area" (2009). More recently, two transnational projects were initiated to support the implementation of the Convention's biodiversity protocol and to contribute to European Union adaptation policies on climate change.

The European Academy of Bolzano, Italy, has also played a key role in providing scientific and technical expertise, based on its former Alpine experience. Following-up on an Alpine-Carpathian partnership launched in 2002, a Memorandum of Understanding between the Alpine Convention and the Interim Secretariat of the Carpathian Convention (UNEP) was signed in 2006. The connection between the two mountain ranges became even more tangible through the EU project "Alps-Carpathians Corridor" (2009–2012), which aims to facilitate ecological connectivity between the Alps and the Carpathians. The collaboration between the two mountain ranges was recognized as a model during the World Summit for Sustainable Development in Johannesburg.

Further information

Carpathian Convention – www.carpathianconvention.org

Science for Carpathians (S4C)

S4C is a regional scientific network that facilitates, coordinates, and enhances collaborative research across disciplines and national boundaries in the Carpathian mountain region. It advocates for a Carpathian research area towards pan-Carpathian research. Created in 2008, S4C brings together scientists from Carpathian countries, as well as scientists worldwide working on the Carpathians. Through its activities, the association provides scientific support to sustainability initiatives in the Carpathian region. In 2011, the network published the Research Agenda for the Carpathians. On the occasion of the second Forum Carpaticum in Stará Lesná, Slovakia (May 2012), S4C signed a Memorandum of Understanding with the Carpathian Convention to improve coordination between research agendas and political needs. The Forum is the main event organized by S4C. Its objective is to integrate different fields of expertise, link research and practice, and stimulate networking between researchers. The first Forum Carpaticum took place in Krakow, Poland, in 2010.

Further information

mri.scnatweb.ch/mri-europe/carpathians/

University of Central Asia

The "Mountain University"

The University of Central Asia (UCA) was founded in 2000 by a treaty between the governments of Kazakhstan, the Kyrgyz Republic, Tajikistan and His Highness the Aga Khan. UCA's mission is to promote the social and economic development of Central Asia, particularly its mountain societies, while at the same time helping the different peoples of the region to preserve and draw upon their rich cultural traditions and heritages as assets for the future. An innovative public private partnership, and the world's first internationally chartered institution of higher education, UCA is a single university operating across three campuses. These are located intentionally in remote mountain areas to deliver high-quality education to local communities, while also serving as a springboard for investment, entrepreneurship, and as the front line for regional social cohesion.

UCA's commitment to regional development is reflected in its approach to starting a new university. The approach begins with community-based, market-relevant, short-term educational and training programmes. It is followed by rigorous research initiatives that bring together regional and international

scholars to establish UCA as a centre of knowledge to address complex regional problems. Based on these programmes, UCA is developing undergraduate and graduate degree programmes, to be launched when campus construction is complete. Campus architecture and parks will incorporate materials and elements of surrounding mountain environments.
UCA's focus on mountains can be traced back to the long-term commitment and experience of the Aga Khan Development Network, in which UCA is embedded, and its various programs in the mountain regions of Central Asia. In 2011, UCA launched the Mountain Societies Research Centre (MSRC), a university-wide, interdisciplinary research centre dedicated to supporting and enhancing the resilience and quality of life of mountain societies through sound research on the sustainable development and management of their physical, social, economic, and cultural assets.

In addition to providing unique opportunities for Central Asian and international researchers and practitioners, MSRC serves as a regional focal point for key international networks and agencies, including the Mountain Partnership and the Swiss National Centre of Competence in Research North-South. Other initiatives at UCA include the Institute of Public Policy and Administration that aims to improve evidence-based public policy in the region through research, policy analysis, and active engagement with stakeholders in government and civil society. UCA's Cultural Heritage Publication Series supports Central Asian scholars who conduct original and high-quality research, publish and disseminate their work to regional and international audiences, highlighting the unique and endangered cultural traditions of mountain and other communities of Central Asia.

UCA has achieved an extensive reach in the region during the pre-operational phase. Since 2006, the School of Professional and Continuing Education has reached over 40,000 learners. Through programmes of the Aga Khan Humanities Project, 172 university faculty from regional institutions have been trained by UCA to implement its innovative multidisciplinary humanities curriculum reaching 6,000 students. Forty-two Central Asian students are pursuing graduate studies at international universities under the Central Asian Faculty Development Programme to develop UCA's future faculty. UCA is among the largest direct and indirect employers at its campus locations, and is the leading educational publisher in Central Asia.

Further information
University of Central Asia – www.ucentralasia.org

Alliance of Central Asian Mountain Communities (AGOCA)

Created in 2003, the Alliance is an association of mountain villages of Kazakhstan, Kyrgyzstan, and Tajikistan. Members are 'Territorial Public Self-governance Bodies', which are citizen associations that carry out development projects and communicate needs, ideas, and visions to state representatives at the local level, and negotiate with them. AGOCA seeks to improve the living conditions of mountain communities. It mainly focuses on awareness raising and capacity building. The Alliance is involved in training villagers and fostering exchange of experiences among its members. AGOCA has 37 members (18 in Kyrgyzstan, 14 in Tajikistan, and 5 in Kazakhstan).

Further information
www.camp.tj/index.php?page=agosa&language=eng

Yellowstone to Yukon Conservation initiative

Connecting habitats

The Yellowstone to Yukon Initiative (Y2Y) targets a vast region of more than 1.3 million square kilometers. Measuring 3,200 kilometers in length and 500-800 kilometers in width, it encompasses five US states (Montana, Idaho, Wyoming, Oregon and Washington), and four Canadian provinces (Alberta and British Columbia) and territories (Yukon and Northwest Territories). The region comprises three main mountain ranges: the Rocky Mountains, Columbia Mountains, and Mackenzie Mountains.

Y2Y promoters characterize the region as "the last intact mountain ecosystem in the entire American Cordillera, outside of Alaska." The idea of "wilderness" is a key driver of the initiative because the region faces various pressures caused by human activities: resource extraction (mines, oil, gas, timber, hydroelectric power generation), industrial development, road construction, and urban expansion.

To address these pressures, a group of US and Canadian scientists and conservationists met in 1993 to develop a regional vision stretching from Wyoming to the Yukon. This vision led to the creation of the Y2Y Initiative in 1997. Y2Y is organized as a not-for-profit organization with offices on both sides of the international border. Funding for its work comes from grants from foundations and governments, donations from individuals, corporate sponsorships, and periodic fundraising events.

Y2Y plays an important role in catalyzing and facilitating local conservation action by a large number of partners throughout the region. Y2Y supporters include local grassroots and community groups, government agencies, funders (both institutional and individual), Native American and First Nations communities and organizations, scientists and researchers, businesses, and concerned citizens. In the first ten years of its existence, Y2Y helped channel USD 45 million to support biodiversity conservation efforts in the region.

Nature preservation in the North American Rocky Mountains has a long history. Yet the Y2Y promoters view their effort as "one of the first groups to apply large-landscape conservation principles to a mountain environment." Y2Y is all about connectivity, a concept used by conservation biologists. It refers to a system of connections between ecosystems for sustaining habitats and populations, for instance of large predators such as the emblematic grizzly bear. Connectivity-oriented conservation is suited to the Y2Y region, where different kinds of protected areas have increased significantly and now account for twenty percent of the land.

Further information
Y2Y Initiative – www.y2y.net

Institutions working at the national level

States have been and still are the most important institutions creating and enforcing rules and regulations for the use and the management of mountain regions. While few states have specific legal instruments or administrative units for mountains, their wide ranging sectoral policies have tremendous impacts in mountain regions. Trade liberalization, privatization, agriculture and forest policies, energy development, cultural minorities policies, tourism development, and many other specific policies have various consequences in mountain areas and for the people who live there. Quite often these consequences are more or less anticipated and taken into account. During the last 150 years, many states (mostly in Europe) have progressively assigned mountain areas a special role in sectoral policies. In almost all Alpine and Mediterranean countries, policies for agriculture, forestry, tourism, and nature conservation obtained specific mountain provisions. Starting in the 1960s, Italy, Switzerland, and France (see case studies) have also created regional, multi-sectoral laws that determine the goals and modes of development and conservation in mountain regions. During the 1980s and 1990s these (Keynesian) approaches came under heavy criticism and were gradually reoriented towards self-reliance and endogenous development. In some countries such as Switzerland, recent legislative reforms have weakened the special role of mountain regions (see case study).

The global recognition of mountain issues, which major events and documents made possible during the last two decades, highlights the importance of the national level in defining the legal status of mountain regions and in ensuring their place in sectoral policies. During the International Year of Mountains (IYM), states were the principal actors in the celebration of mountain assets, but also the targets for calls to formally recognize the value of mountain environments and the right of the people who live there. More than 70 countries officially contributed to the IYM agenda. Some of them passed (or decided to pass) mountain laws for the very occasion, including Poland and Bulgaria. Most of these laws involve the creation of sustainable development strategies that seek to balance socio-economic development and environmental protection. Today, many states have yet to follow this trend. In some countries, mountain laws and institutions at national level are considered unnecessary. In the United States of America, for instance, most mountainous land is administered by the federal government under sectoral policies (but see case study on the Sierra Nevada Conservancy); socioeconomic issues are seen through the lens of urban-rural differences, rather than upland-lowland dynamics.

In centralized countries such as China, Vietnam, or Morocco, where mountain regions are home to cultural minorities, the national government is often reluctant to give official recognition to mountain regions and people. In such contexts, states may commit themselves to regional centers of competence and development programs, such as ICIMOD in the Himalayas. Regional activists or representatives of mountainous cultural minorities may also enter transnational or even global organizations in order to gain international recognition and argue for autochthonous rights. In Morocco, a minority of Berber activists has mobilized transnational Berbers and mountain people associations. States continue to be major protagonists in facilitating (or undermining) the making of institutions for mountain regions. Since the early 1990s, however, global and transnational initiatives have greatly influenced state action in this field. Accordingly, institutional frameworks for sustainable development strategies in mountains and beyond are increasingly organized in complex and multilevel arrangements.

Mountain policies in France

The building of a mountain-specific institutional architecture

France has a long tradition of specific public policies for mountain areas. It was one of the first countries to pay close attention to mountain forests when, in the second half of the nineteenth century, national laws were passed to improve forest and water management. In the 1960s and 1970s, a second generation of laws was adopted in the context of various sectoral policies. Specific measures were taken for maintaining mountain agriculture, which for the first time required the delineation of mountains in 1961. National parks have been created since the 1960s, most of them in mountain regions. Policies were adopted for promoting mountain tourism infrastructure, then gradually modified due to growing concern for environmental and landscape protection that emerged in the mid-1970s. Parallel developments in many other countries, especially in Europe, illustrate similar sectoral approaches.

More original and innovative approaches entailed the regionalization and the so-called territorialization of policies related to mountain areas. After 1973, the application to mountain regions of many national policies came to be organized at the level of massifs. As a result, it became common to distinguish regional entities (Pyrenees, Vosges, Jura, Northern Alps, Southern Alps, etc.), where the distinctiveness of problems was considered sufficient to warrant regional adaptations of national policies. The national government appointed a commissaire for each of these massifs, and a comité de massif consisting of socio-economic actors started

discussing regional issues and advising the national administration. Following the onset of decentralization in the 1980s, most subnational governments (Régions and Départements) with mountain areas were invited to adopt mountain policies and to develop inter-regional conventions for each massif aimed at securing public funding for coordinated regional programmes.

The importance of massifs was further strengthened with the 1985 Mountain Law. The objective of the new legislation was to combine multi-sectoral issues and promote endogenous development at the level of each officially delimited massif. That same year, a national association of elected representatives of mountains regions (ANEM) was set up. ANEM quickly became an effective national lobby in the defense of mountain people and regional interests.

French public institutions have also been highly involved in several trans-frontier institutions that coordinate national and subnational initiatives in mountain areas. Since the mid-1980s, regional governments have set up working groups on both sides of the Pyrenees (Andorra, France and Spain) and the Jura (France and Switzerland). Since 1991, the French State has been a party of the Alpine Convention alongside eight other signatories. These transboundary and regional initiatives illustrate how French institutions have promoted policies and cooperation at the massif level beyond the national borders, while at the same time encouraging the European Commission and EU Members to promote a mountain policy at the EU level. During the last few decades, France has been building one of the most ambitious and systematic institutional architectures for specifying policies for mountain regions and organizing public debate related to mountain issues.

Georgian National Mountain Policy

Legal framework for socio-economic development and self-governance

More than two-thirds of the country of Georgia is covered with mountains. The 1995 Constitution recognizes their specificity: "The state shall take care for the equal socio-economic development of the whole territory of the country. With the view of ensuring the socio-economic progress of the high mountain regions, special privileges shall be determined by law" (Article 31). This constitutional recognition led to the adoption of the 1999 Law of Socio-economic and Cultural Development of High Mountain Regions. In addition, the 2005 Organic Law of Georgia on Self-Government recognizes mountains as specific regions by stating the necessity "to ensure legislative provision for the peculiarities of exercising self-governance in high mountainous regions and other territories of Georgia specified by the Georgian legislation." A Parliamentary Committee for Regional Policy, Self-Government, and Mountainous Regions has been set up to overview mountain and self-governance laws. Despite these efforts and otherwise successful reform of self-governance, no legislative provisions have been secured for mountain regions.

The Law of Socio-economic and Cultural Development of High Mountain Regions seeks to prevent outmigration from mountain areas through mechanisms such as preferential loans for investment in mountain areas. However, synergies between the mountain law and other legal instruments and national policies are lacking. As a result, Georgia's mountain law is largely ineffective. Current development policies focus on general economic growth of the country, with little consideration for the specificity of mountain territories. For instance, the 2010-2017 State Strategy on Regional Development of Georgia only refers to mountains in a statement relating to infrastructure development for internal flights and one relating to tourism development.

Recent governmental programmes have supported development in mountain areas of Georgia (e.g. the rebuilding of the Svaneti tourism infrastructure), road and hospital construction, and the rehabilitation of schools in mountain regions. Yet there is a crucial need for establishing specialized adaptive management regimes for sustainable mountain development. Socio-economic, environmental, and cultural conditions in Georgia's mountain regions often differ from gorge to gorge. Hence legal provisions and policy measures should be both flexible and supportive of local populations.

For more than a decade, mountain development in Georgia has been promoted by several non-governmental organisations (NGOs), including the Georgian Union of Mountain Activists, the Georgian Mountain Federation, and the Regional Environmental Centre for the Caucasus. With support from international development agencies, these organizations implement projects and programs promoting sustainable mountain development with a focus on local mountain communities. To date, NGOs have to rely on donor initiative and lack the capacity to institutionalize the results of their activities.

Further information

Castelein, A., Thuy V.D.T., Mekouar M.A., Villeneuve A. (2006) Mountains and the Law: Emerging Trends. Rome: Food and Agriculture Organization.

Swiss National Mountain Policies

A changing focus on mountains

Switzerland has a long tradition of policies for its mountain regions. A national policy was first elaborated in the late nineteenth century to halt deforestation in mountain areas. In the first two decades of the twentieth century, members of parliament repeatedly pointed to the risk of depopulation as a rationale for financial support to mountain areas. Although federal support continued to focus on agriculture, some funds were now earmarked for infrastructure development. Lobbies and organizations were created in the middle of the twentieth century to support mountain populations. Since most of these people were farmers, the majority of policies have focused on mountain farming. However, in the second half of the twentieth century, agriculture policy measures were no longer thought sufficient to address the numerous challenges faced by mountain communities. In response, a more comprehensive policy was formulated in 1974. The Law on Investment in Mountain Regions (LIM) aimed to counterbalance the increasing economic gap between the mountain areas and the rest of the country by fostering infrastructure development through low-interest loans to mountain municipalities. The 1974 law established fifty-four mountain regions, each of which was required to create an inter-municipal organization and elaborate a common regional development plan.

The national mountain policy regime has gradually changed since the 1990s. Already in 1997, the LIM was revised to focus on adding value through investments. In 2008 Switzerland's overall approach to regional development changed completely with the launching of the New Regional Policy. Rather than seeing mountain areas as regions with handicaps that need to be compensated, they were now viewed as areas with assets that need to be valorized. Existing policies were argued ineffective in improving the economic attractiveness and competitiveness of mountain regions. Hence emphasis was now placed on strengthening competitiveness and innovation in mountain areas, so these regions could position themselves in a globalized economy. Furthermore, mountain regions were no longer the only regions that could receive support under regional development policy as special programs began to target metropolitan regions. At the same time, sectoral policies, mainly in agriculture and forestry, evolved to stress the multifunctionality of mountain farming and the need to compensate financially cultural landscape preservation and biodiversity conservation.

For more than a century, policy support for mountain regions remained unquestioned. In a context of budgetary tightening, such support faces growing opposition. The future of mountain areas will depend on how they can position themselves to meet the expectations of an urbanized Swiss society. In this context, highland-lowland linkages will play a decisive role.

Swiss Centre for Mountain Regions (SAB)

Created in 1943, the Swiss Centre for Mountain Regions (SAB) contributes to the improvement of living conditions and the enhancement of development potential in mountain communities and regions. To achieve these goals, the organization lobbies on behalf of mountain regions, provides expertise to its members, and informs the general public about mountain issues and mountain communities, especially regarding new political developments. This mountain lobby has for members: mountain states (cantons), hundreds of mountain municipalities, agricultural and tourism organizations, and any organization or concerned citizen involved in mountain issues. SAB has been playing a decisive role in keeping mountain issues on the Swiss political agenda.

Further information
www.sab.ch

Sierra Nevada Conservancy

Channeling investment for the Range of Light

The Sierra Nevada conservancy (SNC) is a public agency of the state of California, created in 2004 with the primary purpose of allocating funding for environmental preservation and supporting economic sustainability across the Sierra Nevada mountain range. The SNC region consists of all or part of twenty-two counties covering a quarter of the state's territory. The Sierra Nevada is the state's principal watershed, supplying sixty-five percent of the developed water supply to residents, agriculture, and other businesses and industries across the state. The range is is one of the most significant natural and biologically diverse regions in the world and home to sixty percent of California's animal species and almost half of its plant species. It hosts more than fifty million recreational visits per year and is home to more than 600,000 residents.

As California's largest conservancy, the SNC provides grants to local governments for environmental protection, resource conservation, recreational opportunities, and economic growth. Headquartered in Auburn, the SNC is governed by a 16-member board voting members divided almost evenly between

State-level appointments and local seats filled by members of County Boards of Supervisors; federal agencies are represented by non-voting liaison advisors. The Board's small staff includes the SNC Executive Officer and Assistant Executive Officer.

In its first five years, the Conservancy awarded approximately USD 40 million in grants for projects including fuel reduction, conservation easements and acquisitions, and watershed and habitat restoration in partnership with local government, nonprofit organizations and Tribal entities. Unlike many government programs for mountain regions around the world, the SNC receives no general fund tax dollars. Instead, funding for projects comes mainly from Proposition 84, a bond act for safe drinking water passed by California voters in 2006. Additionally, the SNC may receive funds and interests in real or personal property by gifts, bequests or grants.

All activities supported by the SNC contribute to seven legislatively mandated program areas across the spectrum of sustainable mountain development: increasing opportunity for tourism and recreation; protecting, conserving, and restoring physical, cultural, archaeological, historical and living resources; aiding in the preservation of working landscapes; reducing the risk of natural disasters, such as wildfire; protecting and improving water and air quality; assisting the regional economy; and enhancing public use and enjoyment of lands owned by the public. Specific recent initiatives include the development of a Climate Action Plan, the Sierra Nevada Forest and Community Initiative, and the Sierra Nevada Geotourism MapGuide Project.

A recently adopted three-year strategic plan establishes five areas of focus: healthy forests, preservation of ranches and agricultural lands, watershed protection and restoration, promotion of sustainable tourism and recreation, and long-term effectiveness of the SNC.

Further information

Sierra Nevada Conservancy –
www.sierranevadaconservancy.ca.gov

Institutions working at the local level

Community Based Tourism in Kyrgyzstan

Development through Community Based Tourism

With ninety-four percent of the national territory above an altitude of 1,000 m.a.s.l., mountains cover most of the Kyrgyz Republic. They are major assets for tourists visiting this Central Asian country. Since a significant share of tourists are attracted by the country's nature and culture, community based tourism (CBT) has a great potential for income generation among local communities.

CBT represents an innovative institutional development whereby local communities retain control of tourism development and management. In 1999, the Swiss Association for International Cooperation (HELVETAS, now called Swiss Intercooperation), launched the Community Based Tourism Support Project in Kyrgyzstan to support capacity and institution building, notably through training in managing projects, conflicts, and organizations. Under the project, fifteen CBT groups have been created since villagers of Kochkor launched the first one in 2000. CBT groups are self-governing non-commercial organizations that provide tourist services. They are constituted by several family-based enterprises. Additionally, five "shepherd's life" associations join shepherd families who offer tourist lodging in traditional Yurts while spending the summer in their mountain pastures ("jailoos"). The number of families involved in CBT has steadily increased from 38 in 2000 to 140 in 2002 and 288 in 2011, when total turnover reached some USD 200,000.

To consolidate the success of CBT, the Kyrgyz Community Based Tourism Association "Hospitality Kyrgyzstan" (KCBTA) was created as a national CBT Association in 2003. KCBTA serves as the umbrella association of CBT groups and shepherd's life associations. Its stated objective is "to improve living conditions in remote mountain regions by developing a sustainable and wholesome ecotourism model that utilizes local natural and recreational resources." KCBTA markets the products and services of its members worldwide. For this purpose, the Association attended ITB Berlin in 2012, which is the leading international travel trade show. In 2011, KCBTA also joined the European Union project "Strengthening Tourism Business Intermediary Organizations for Sustainable Economic Development of Central Asia," which aims to promote regional marketing of Central Asia in a globalized tourism market.

Further information

Kyrgyz Community Based Tourism Association/Hospitality Kyrgyzstan(2006), Community based tourism guide book, Bishkek: KCBTA – www.cbtkyrgyzstan.kg

Community Forestry in Nepal

Community initiative for global sustainability

Community forestry (CF) in Nepal can be considered a successful community-led initiative that has enhanced the re-greening of degraded hills and mountains and improved the livelihoods of forest dependent mountain dwellers. This is a nationwide programme covering all seventy-five districts and three physiographic regions of Nepal. Community-based forest management is probably one of the largest and longest ongoing participatory forest management initiatives in the world. It involves approximately forty percent of the population and twenty-five percent or 1.25 million hectares of the country's forest areas. Since 1978, the government of Nepal has been implementing CF with the support of various international technical partners and key donors. Initially more than sixty percent of CF budgets came from donor-funded projects, mainly to pay for the handing over of management responsibilities and training activities. Following the transfer of forests, however, donors gradually pull out.

CF was promoted after decades of blanket application of nationalization policy had led to the breakdown of centuries-old traditional forestry governance systems. Throughout the 1960s and 1970s, despite the imposition of stringent forestry rules, forests declined drastically, both in quality and quantity. Widespread concern over Himalayan environmental degradation and shifts in the global forestry paradigm stimulated the recognition of the role of people in sustainable forest management.

Today Nepal is recognized for one of the most progressive forest policies in the world and is considered a leader in participatory forestry. Starting as an environmentally focused subsistence-based forestry practice, the CF programme has evolved into an example of good green governance and contributed to local democracy and sustainable rural development.

The impacts of CF are impressive and multidimensional. The Nepalese Department of Forests claims that CF has been successful in restoring degraded forest land, increasing water flow, resuming greenery, increasing and conserving biodiversity, increasing the supply of forest products, empowering rural women, the poor and disadvantaged groups, promoting income generation and community development activities, and improving the livelihoods of forest-dependent people in rural areas. The CF programme can be considered as a vehicle for community development, environmental stabilization and contribution to the sustainable development of the mountainous country. Moreover, the initiative proved to be instrumental in promoting

democratic governance and social inclusion, contribution to social transformation in the country.

Despite wider appreciation, acceptance, and impressive outcomes, CF in Nepal has its weaknesses, controversies, and complications. So far no comprehensive monitoring and evaluation system of community forestry exists; as a result distortions are appearing. Some also argue that the success of community forestry has been uneven. Forest bureaucracy often resists the devolution of power to communities. Timber harvesting in community forests has been below the production capacities of the forests. Elite domination persists and CF benefits are not distributed equally. Gender issues and pastoral needs are posing additional challenges. On the other hand, the diversification of actors during the last decade has made CF a multi-stakeholder business rather than the business of a government forestry department and forestry users only. The emergence of carbon forestry (REDD+) has introduced new opportunities and at the same time added challenges.

All these factors are making CF management more complex. Linking community forestry programmes to the larger interests of market and environmental governance will demand complex, formal, and externally dominated institutional arrangements. Furthermore, when subsistence-oriented community forestry moves into an enterprise-oriented mode, it elevates the concerns of equity, gender, and good governance. It also adds the new challenges of enterprise management and marketing, commercial production of forest products, and biodiversity conservation. Under the planned federal political structure, Nepal should ensure that adequate skills, capacities, and institutional frameworks at all levels help build on the local success story of CF, and derive benefits from new opportunities while adequately safeguarding gains already made.

Further information

ICIMOD – www.icimod.org
(Regional Report: Sustainable development in the Hindu Kush Himalaya. 2012)

Land Trusts

Mobilizing land owners for sustainable mountain development

In the institutional framework for sustainable mountain development, land trusts and the instrument of conservation easement represent an innovative approach for combining public private interests. A land trust is a nonprofit organization that conserves land by undertaking or assisting in land or conservation easement acquisition, or by its stewardship of such land or easements. Land trusts operate throughout Canada, United States of America, and Mexico, as well as other parts of the world. In the U.S. alone, there are 1,700 land trusts that have more than 100,000 volunteers and 5 million members. US land trusts have conserved nearly 150,000 km^2 of land in America. While most land trusts operate at the local level, a small number of land trusts are active worldwide.

Although land trusts are not specific to mountain areas, their goal of preserving sensitive natural areas, farmland, ranchland, water sources, cultural resources, or notable landmarks in perpetuity is well suited for mountains. Land trusts that focus on mountains include the Mountain Area Land Trust (Colorado), White Mountain Land Trust (Arizona), Coastal Mountains Land Trust (Maine), Blue Mountain Land Trust (Washington State), Mountain Conservation Trust (Georgia), and Sierra Foothills Conservancy (California). Land trusts typically work with landowners and the community to conserve land by accepting donations of land, purchasing land, negotiating private, voluntary conservation agreements on land, and managing conserved land for future generations.

Most land trusts make use of conservation easements. In the U.S., a conservation easement is an encumbrance – sometimes including a transfer of usage rights – that creates a legally enforceable land preservation agreement between a landowner and a government agency (municipality, county, state, federal) or a qualified land protection organization (such as a land trust), for the purposes of conservation. A conservation easement generally restricts real estate development, commercial and industrial uses, and certain other activities, to a mutually agreed upon level. Although a conservation easement prohibits certain uses by the landowner, such an easement does not make the land public. The restrictions of the easement, once set in place, "run with the land" and are binding on all future owners of the property.

Protection is thus achieved primarily by separating the right to subdivide and build on the land from the other rights of ownership. The landowner who gives up these "development rights" may receive significant tax advantages for having donated and/or sold the conservation easement. In accepting the conservation easement, the easement holder is responsible for monitoring the use of the land, for ensuring compliance with the terms of the easement, and for enforcing the terms in cases of noncompliance.

Further information

Land Trust Alliance – www.landtrustalliance.org

Payments for Ecosystem Services in Costa Rica

Compensating mountain stewardship through innovative financing mechanisms

Payment for environmental services (PES) approaches seek to mobilize economic incentives for protecting natural resources while accommodating agricultural production, forestry, tourism, and drinking water supply. Hundreds of PES schemes are now being implemented around the world covering four main ecosystem services – water provisioning, carbon sequestration, landscape amenity, and biodiversity conservation – that are of significance in mountain areas. Watershed PES programmes involve direct payments to compensate upstream resource users for their natural resource stewardship and changes in land use that generate ecological services to downstream beneficiaries. While most current schemes are spontaneous private market-type arrangements at the local level, large PES schemes tend to be government driven. In many places, PES approaches have been found to be cost-effective means for resource conservation and sustainable ecosystem management.

Costa Rica is a leader among Latin American countries in the design and implementation of PES approaches. Since 1997, a national Payments for Environmental Services programme (PSA) has provided payments to thousands of farmers and forest owners for reforestation, forest conservation, and sustainable forest management. The program emerged from a new forestry law, which took into account the value of carbon fixation, hydrological services, biodiversity protection, and the provision of scenic beauty. The law prompted a reform of the National Forestry Finance Fund, a decentralised organization mandated to collect and administer the financial resources of the forest sector, including those of the PSA programme.

One example of a project under the country's PSA scheme concerns a cooperation mechanism between La Esperanza Hydropower Project (downstream water user) and the Monteverde Conservation League, a conservation NGO that owns most of the hydropower plant's upper watershed. The objective of the mechanism was to conserve forest cover where it already existed, since forests are perceived to provide a range of downstream hydrological services for which the hydropower producer was willing to pay. Under the mechanism, a 99-year contract was signed, committing the hydropower producer to pay the forest owner for maintaining the forest cover on its property. The payment increased through the first five years of the contract; since then, the amount of power produced and the tariff at which the power is sold has been factored into the calculation of payments.

PES schemes represent a significant institutional innovation that can contribute to sustainable mountain development. Around the world, they have been designed specifically to compensate the stewards of upstream areas for ensuring that downstream users benefit from hydrological and other services.

Further information

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Water User Associations in Kenya

Improvement of water management and peace keeping

Mount Kenya, Africa's second highest mountain, is the water tower for over seven million people living in its surroundings. All the rivers crossing the region originate from this mountain. Water resources have come under increasing pressure in recent decades, especially in Laikipia, the semi-arid region northwest of Mount Kenya. In the upper reaches of the watersheds, massive immigration has increased the population from 58,000 in 1962 to over 300,000 in 1999. Large-scale irrigated horticulture for European markets has experienced a boom since the early 1990s. As a result of these developments, water is becoming increasingly scarce, and is in ever greater demand. The potential for open and violent conflicts over water use has become real.

In a bid to prevent such conflicts, the authorities, together with researchers, started focusing on effective and equitable water use as early as 1984. One of the results of this initiative was the emergence of Water User Associations (WUAs). These groups include the main users along a river, such as large-scale horticulturalists, small-scale farmers, urban populations, pastoralists, and tourists. WUAs have provided a platform for negotiating resource-sharing arrangements and conflict resolution mechanisms with clearly defined rules and enforcement procedures.

Although the creation of WUAs took some time, subsequent progress was rapid. The first WUA in Laikipia was formed in 1997. By 2003, 13 associations were in place, increasing to 38 in 2011. And they were effective: of the 52 cases of water-related conflicts between 1997 and 2003, 48 were resolved by WUAs, while 4 were referred to the courts.

Water User Associations as institutions have of course not increased the overall availability of water. But water is now shared more equitably in the region. Moreover, there are unexpected benefits: WUAs have also in fund raising for effective water use through drip irrigation, rainwater harvesting, and improved river water storage, as well as for catchment protection through afforestation. Unexpectedly, but possibly owing to the inter-ethnic alliances resulting from long-term resource sharing negotiations facilitated by WUAs, the region northwest of Mount Kenya was never affected by the post-election violence experienced in Kenya in 2008.

In 2004, WUAs were formally recognized in Kenya's new Water Law as institutions dealing with local water management; previously they had been merely tolerated or, at times, considered illegal. The law does not grant them explicit legal power and their potential remains limited due to the lack of financing, technical skills, logistical support, and limited managerial and leadership capacities.

Further information
CETRAD – www.cetrad.org

Conclusions

The world has experienced considerable changes since the mountain chapter of Agenda 21 was adopted in 1992. The earth's human population has increased by more than 30 percent. World domestic product has more than doubled, while trade and financial interdependence have mushroomed, yet the gap between rich and poor remains significant. As reported in the Millennium Ecosystem Assessment, numerous vital life-supporting functions are under stress. At the dawn of twenty-first century, multiple and linked environmental, economic, financial, food, and energy crises present unprecedented challenges for the pursuit of sustainable development.

Mountains coming together

These challenges have had an extensive and varied impact on mountains around the world. In response, an impressive set of local, national, regional, and global institutions has fostered attention to the unique position of mountains – as water towers, homes of dynamic cultural heritage, hotspots of biodiversity, and sites of important natural resources and ecosystems. Organizations around the world have given life to these institutions, building bridges between them and demonstrating profound commitments to sustainable mountain development. In light of the three features of institutions proposed here, several key trends between 1992 and 2012 can be highlighted.

Broadening the constituency
Since the Earth Summit, mountains have gained a global following. Chapter 13 of Agenda 21, the International Year of Mountains, the creation of the International Mountain Partnership, and the explicit mentioning of mountains in various UN resolutions and international conventions have ensured that mountains remain on the political agenda. While the alliance of scientists and selected national governments played the most important role as agenda setters, the breath of actors implementing sustainable mountain development has broadened.

On the one hand, this diversification resulted from the emergence of new institutions and organizations such as regional mountain conventions and initiatives, networks of non-governmental organizations, or alliances of municipalities. On the other hand, the new legitimacy of mountains as a platform for mobilization has generated new interest in established institutions such as mountain farmer cooperatives, resource user groups, or mountain tourism operators and promoters. Today, the institutional framework for sustainable mountain development is an example of multi-stakeholder governance.

Integrating regional development
In tandem with the growing range of mountain actors, the consolidation of sustainable mountain development as an international norm has brought economic, environmental, and social dimensions more closely together. In the past, mountains were largely the focus of sectoral policies in forestry, agriculture, energy development, or tourism. During the last twenty years, regional development strategies and programs for mountains have encouraged policy integration and promoted sustainable development as an overarching principle.

Despite this institutional turn to mountain regions, however, mostly sectoral approaches at multiple scales continue to shape developments in mountain ranges. Some of these are embedded in international and regional conventions for biodiversity, water management, or economic integration. Where such approaches fail to distinguish between mountain and lowland areas, core-periphery relations can be magnified. At the same time, there has been a trend among regional economic integration organizations to recognize the special role of mountains within their policies and programs.

Finally, concerted efforts to address the impacts of human-induced climate change have become relevant in mountain regions worldwide. In particular, strategies and action plans for climate change adaptation are being developed from California's Sierra Nevada to the Alps, the Carpathians, and the Himalayas. Due to the particular exposure of mountain regions to climate change, corresponding action has the potential to strengthen the institutional framework for sustainable development by bringing together multiple goals.

Transcending political boundaries
The creation of a multitude of transboundary mountain conventions and initiatives no doubt constitutes a hallmark in the evolution of institutions for sustainable development since 1992. These initiatives are in various stages of development and institutionalization, which has allowed extensive cross-fertilization and learning. What is common to many of them is that their participants have sought to align the initiative's operational reach with a mountain ecoregion. Increasingly, however, territorially defined mountain regions such as the Alps or the Carpathians begin to be placed in the larger context of urban-rural links. These links are reinforced by economic interdependencies between mountains and metropolitan areas, as well as the growing trend of multilocal dwelling and labor migration.

At national and local levels, the reach of operations of many institutions and mountain organizations has equally evolved in the direction of ecoregional entities. The most evident manifestation of this

trend involves institutions for watershed or river basin management. These often cut across mountain regions. In many cases, synergies can emerge, such as in the case of initiatives surrounding the Danube-Carpathian region, or the river basins linking the Himalayas with the South Asian coastal areas. A final example of the changing reach of operations is seen in the spread of payments for ecosystems services. These mostly national or local approaches can similarly bring together mountain and non-mountain areas in synergetic ways.

The Road from Rio to Rio+40

The institutional framework for sustainable development in mountain regions has made great strides since 1992. Many key lessons have been learned, including the importance of integrating science, policy, and practice; the need to enhance comprehensive strategy with adequate participation and representation; and the value of long-term perspective. The examples presented in this report illustrate these lessons around the world. Above all, they have shown how building bridges between the local, national, regional, and global levels has been an asset.

Just as awareness of mountain issues has grown since 1992, the challenges to mountain areas are greater than ever. For this reason, the institutional framework for sustainable development as it concerns mountains has never been more significant – learning the lessons from institutional and organizational experiences generated in mountains during the last 20 years will be useful to support adaptation in mountains and ensure that sustainable development remains a central concern of current and future generations.

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Mountains, green economy and institutions for global sustainable development
prepared by Thomas Kohler and Jörg Balsiger

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prepared by Jane Pratt (The Mountain Institute) and Thomas Kohler
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Abbreviations and Acronyms

AC	Alpine Convention
ALPARC	Alpine Network of Protected Areas
CBD	Convention on Biological Diversity
CBT	Community based tourism
CC	Carpathian Convention
CDE	Centre for Development and Environment, University of Bern
CF	Community forestry
CIPRA	International Commission for the Protection of the Alps
CONDESAN	Consorcio para el Desarrollo Sostenible de la Ecoregión Andina
DCPO	(WWF) Danube-Carpathian Programme Office
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GEF	Global Environment Facility
GMBA	Global Mountain Biodiversity Assessment
ICIMOD	International Centre for Integrated Mountain Development
IGO	Intergovernmental organization
IIED	International Institute for Environment and Development
ISCAR	International Scientific Committee on Research in the Alps
IUCN	International Union for Conservation of Nature
IYM	International Year of Mountains
KCBTA	Kyrgyz Community Based Tourism Association
LIM	Swiss Law on Investment in Mountain Regions
MAB	Man and the Biosphere
MP	Mountain Partnership
MSRC	(UCA) Mountain Societies Research Centre
NGO	Non-governmental organization
PES	Payments for environmental/ecological services
REDD	Reduced emission from deforestation and forest degradation
SAB	Swiss Centre for Mountain Regions
SBSSTA	Subsidiary Body on Scientific, Technical and Technological Advice (CBD)
SDC	Swiss Agency for Development and Cooperation
SMD	Sustainable Mountain Development
TMI	The Mountain Institute
UCA	University of Central Asia
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNEP-WCMC	United Nations Environment Programme World Conservation Monitoring Centre
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UNWTO	United Nations World Tourism Organization
WSSD	World Summit on Sustainable Development
WWF	World Wildlife Fund
Y2Y	Yellowstone to Yukon Initiative

In 1992, at the United Nations Conference on Environment and Development – commonly referred to as 'Rio 1992' or 'the Rio Earth Summit' – mountains received unexpected high political attention. They were granted a chapter in the 'Agenda 21' as fragile ecosystems that matter for humankind.

Since then, efforts by different actors have been undertaken to promote Sustainable Mountain Development. Some of them relate to the above event, others just emerged on their own. However, in view of the UN Conference Rio+20 – United Nations Conference on Sustainable Development in 2012 it seemed relevant to assess and understand what has been achieved by whom and how. It appears equally important to learn what has worked and what has not worked, and why, in order to draw lessons for more effective interventions in future. The anticipation of possible future challenges or opportunities may further help to be better prepared for their management. This will certainly encompass the adaptation to and mitigation of global change as the mainstream concern of the last decade as well as the new, albeit disputed paradigm of a Green Economy. As in the past, major unexpected and unpredictable political, social, economic or technological innovations may overshadow such mainstreams.

The Swiss Agency for Development and Cooperation, committed to sustainable mountain development since many decades, has commissioned a number of regional reports to assess achievements and progress in major mountain regions such as in particular Central Asia, Hindu Kush-Himalaya and the South East Pacific, South and Meso America or the Middle East and North Africa. The Swiss Federal Office for Spatial Development has commissioned - in the context of the Swiss Presidency of the Alpine Convention 2011/12 – a report on the European Alps. In addition, UNEP has facilitated the production of the report on Africa's mountains and mountains in Central, Eastern and South Eastern Europe; and the Aspen International Mountain Foundation together with the Telluride Institute has prepared a report on the mountains of North America.

The insights gained through these reports, which were presented at the Lucerne World Mountain Conference in 2011, and in which key local, regional and global actors have been actively involved provided the inputs for a mountain section in the outcome document of Rio+20. They are also meant to feed into future global and regional processes, institutional mechanisms, and initiatives that emerge as a result of Rio+20 in support of Sustainable Mountain Development.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
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CDE CENTRE FOR DEVELOPMENT AND ENVIRONMENT

mri mountain research initiative

TELLURIDE INSTITUTE

IMS International Mountain Society

ICIMOD

CONDESAN
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UNIVERSITÉ DE GENÈVE

UCA UNIVERSITY OF CENTRAL ASIA
Mountain Societies Research Centre

ASPEN INTERNATIONAL MOUNTAIN FOUNDATION

Mountain Partnership