International experience in transboundary mountain governance: insights for Andean cooperation

Balsiger, Jörg; Dupuits, Emilie Françoise; Scolobig, Anna

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Jörg Balsiger, Emilie Dupuits, Anna Scolobig

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Corresponding author

Jörg Balsiger, Institute of Environmental Governance and Territorial Development, University of Geneva, Boulevard Carl-Vogt 66, 1205 Geneva, Switzerland. Contact: Joerg.Balsiger@unige.ch

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Executive Summary

Regional cooperation in transboundary mountain ranges has a long history. Over the course of the past three decades, a wide range of institutional arrangements and practices have emerged at the interface of a shared global mountain agenda and the particular regional opportunities and constraints of participating actors. Regional mountain initiatives are also influenced by a historical context shaped by such factors as the rise and fall of international treaty making and the appearance of alternative forms of governance. While promoters of regional mountain range governance (MRG) initiatives can draw on a rich variety of experiences, the paths to be forged must be the outcome of dialogue, negotiation and commitment of the concerned parties.

The objective of this report is to support and accompany the Andean MRG process by providing insights into international MRG experience (Section 3), an overview and case studies of efforts to incorporate ecosystems-based adaptation (EbA) into MRG (Section 4), and an overview and case studies of relevant Latin American regionalization initiatives (Section 5). These elements serve as a basis to identify core elements of MRG scenarios for Andean MRG (Sections 5 and 6). The report was elaborated using desk research, expert interviews, and a stakeholder consultation during the November 2018 Ministerial Consultation of the Andean Mountain Initiative (AMI-MC). The outcomes of the report contribute to the UN Environment project "Accelerating Climate Action under Euroclima+"; it was elaborated by the University of Geneva's Institute of Environmental Governance and Territorial Development, with inputs from the Mountain Research Initiative. The opinions expressed in this report are those of the authors.

Conceptual framework

The overview and assessment of international and Latin American experience mobilizes two key concepts: regional governance opportunity structure (RGOS) and transition paths (TPs). The RGOS has eight dimensions, which help evaluate the institutional fit, i.e. the feasibility of transferring an MRG model from one context to another:

- Territoriality: spatial scope of the initiative, both in terms of the members' jurisdiction and the spatial ambit of the arrangements;
- Institutional formality: degree of legalization, or informality, and means of enforcement;
- Sectoral integration: number of sectors and institutional mechanisms linking them;
- Vertical coordination: diversity and nature of involvement by governmental actors at different levels, as well as acceptance of and mechanisms for applying subsidiarity (multilevel governance);
- Civil society participation: degree and nature of involvement of non-governmental organizations and the private sector;
- Science-policy interface: nature of institutional mechanisms for bilateral exchange between policy makers and scientists;
- Funding arrangements: assessment of funding sources (and diversity) and outlays, to the extent that information is available; and

- Climate change related ecosystem-based adaptation: treated separately due to the rarity of explicit EbA mainstreaming to date, this feature is included here to incorporate those examples that are known.

The concept of TPs addresses the temporal dimension in terms of the length and nature of stages of the regional governance cycle, as well as the nature of institutional change over time. In this report, based on the AMI Ministerial Consultation, two time horizons are considered, a 4-year time horizon (medium term) and an 8-year time horizon (long term). The TP concept implies path dependence, where medium-term actions re-enforce or impede long-term actions. The notion of TP is at the heart of the scenario analysis.

International MRG experiences

An examination of selected MRG experiences from the Pyrenees, Jura, Alps, Carpathians, Balkan Mountains and Dinaric Arc, Caucasus, Central Asia, Himalayas, East Africa, and Rocky Mountains provides numerous examples of the key RGOS elements summarized in the table below.

	Pyr	*Jur*	*Alp*	*Car*	*Bal*	*Cau*	*Him*	*CA*	*EAf*	*Y2Y*
Territoriality			x	x						x
Formality	x	x	x	x						
Cross-sectoral integration	x	x	x	x	x	x				x
CSO participation						x		x	x	x
Science-policy interaction	x	x		x		x	x	x		
Climate change adaptation			x				x		x	

Pyr: Pyrenees; Jur: Jura; Alp: European Alps; Car: Carpathians; Bal: Balkans/Dinaric Arc; Cau: Caucasus; Him: Himalayas; CA: Central Asia; EAf: Eastern Africa; Y2Y: Yellowstone to Yukon Initiative.

Some general tendencies include the following (an in-depth review of each MRG cas is beyond the scope of this report):

- *Territoriality (T):* Almost all MRG arrangements recognize some form of biogeographical ecoregion, but the way they are formalized varies widely. A striking contrast is between the Alpine Convention, which defines its spatial scope on the basis of municipal boundaries) and the Carpathian Convention, which has no formal spatial delimitation. National or subnational administrative boundaries usually play an important role, especially where MRG arrangements are tied to funding instruments with formal eligibility criteria. In some MRG contexts such as the Alps or the Pyrenees, parallel MRG exist with their own, partially overlapping spatial delimitations.
- *Institutional formality (IF):* Only two MRG arrangements are legally binding treaties (Alpine and Carpathian Conventions), though treaty negotiations were led in the past in the Caucasus, Balkan Mountains and Dinaric Arc. Due to the high transaction costs of treaty negotiation, the focus in most MRG cases has been on implementation activities, which however generates their own coordination-related transaction costs.

- *Sectoral integration (SI):* the relevance of multiple sectors is one of the defining features of MRG. Accordingly, all MRG arrangements focus on multiple sectors, albeit with different integration mechanisms (sectoral protocols, strategic action plans, working groups, transboundary networks, etc.). At the same time, sectoral integration in an MRG context is no easier than in other policy domains. In this regard, the territorial focus inherent in MRG is often suggested as a facilitating factor.
- *Vertical integration/coordination (VI):* Integration in the sense of coordination between the regional, national and local levels is also a defining feature of most MRGs, but not all cases show the same openness to subnational and local governments. In general, the more formal an MRG instrument, the less access subnational governments have; in some cases, lack of access has prompted the emergence of specialized coordination entities. In all European cases, subnational authorities play a key role in the design and implementation of MRG-related territorial cooperation programs.
- *Civil society participation (CSP):* As in the case of vertical coordination, the participation of civil society organizations (CSOs) is widespread but the nature and mechanisms of participation are as diverse as CSOs themselves are. They range from observer status in formal treaties to agenda setting capacities via working groups and project implementation. In the case of the Yellowstone-to-Yukon (Y2Y) the entire MRG arrangement is carried by a CSO.
- *Science-policy interface (SPI):* Scientific knowledge has different functions with regard to MRG and some form of scientific entity has emerged in almost all MRG cases. Some of these predate the establishment of MRG and continue to exist as independent entities only loosely linked and responding to MRG structures and knowledge needs. Others were created as observatories or monitoring organizations to respond to specific MRG data needs, such as in the Jura and the Pyrenees. In the Himalayas and the Caucasus, scientific entities are the locus of regional cooperation, producing knowledge of relevance to scientists, policy makers and practitioners.
- *Funding arrangements (FI):* MRG relies on an enormous diversity of funding sources, with a clear difference between MRGs covering EU members and MRGs in developing or countries. In the European context, MRG benefits from different territorial cooperation programs, although their spatial scope does not usually follow a strict ecoregional definition of the concerned mountain range. In developing and transition countries, funding for MRG often comes from bilateral and multilateral donors. In both cases, national governments are important sources of investment, though usually through sectoral instruments such as agriculture policy. Relatively little is know about the nature and scale of private sector investment in MRG
- *Climate change related ecosystem-based adaptation (EBA):* Climate change has been on the international political agenda for thirty years and the special role of mountains, both because of their vulnerability and their early warning potential, has long been recognized. Yet explicit incorporation of adaptation is a recent trend; cases of EbA in MRG are very rare.

EbA Mainstreaming

There is a strong momentum at the global policy level for EbA and more generally to link ecosystem management, nature-based solutions (NBS), disaster risk reduction (DRR) and climate change adaptation (CCA). Eco-DRR/CCA/NBS/EbA practices are also proliferating through community-based and field level projects, often in mountain regions. The biggest challenge today is the translation of global policy commitments into national, transnational and local level policies and legal frameworks as well as the development of guidelines, technical standards, baseline approaches, institutional mechanisms and processes that encourage implementation. Mainstreaming EbA may have multiple benefits but EbA integration into policies is only a first step for strengthening governance arrangements. There is a need to identify the defining features of successful governance models and innovative institutional arrangements and policies for Eco-DRR/CCA/EbA.

For this report, no EbA cases at the scale of an entire mountain range could b e identified, which provides an indication of the challenges ahead. In the two most established MRG cases (Alps and Carpathians), increasing relevance is attributed to climate change adaptation and ecosystem protection, yet EbA and Eco-DRR are not the center of the agenda. Elsewhere, several local and country-specific EbA examples in mountain regions can be found. In South America, examined cases include the Nor Yauyos Cochas Landscape reserve in the Peruvian Andes and the national EbA program in Colombia; at the regional level, some activities have taken place in the context of the Andean Community of Nations. Three of the four in-depth case studies examine EbA in a transboundary context: Tacaná Watersheds transboundary water governance through local community ecosystem-based action (Mexico-Guatemala); Sustainable mountain ecosystems management in the High Pamir and Pamir-Altai Mountains (Tajikistan-Kyrgyzstan); and Isar river ecosystem-based restoration (Austria-Germany).

The main barriers to EbA integration in MRG include:

- EbA related barriers, including limited evidence of EbA effectiveness and knowledge about unintended consequences, lack of unified and harmonized data, lack of standardized technical guidelines for EbA measures, and insufficient EbA funding models
- Transboundary related barriers, including political priorities, divergent funding mechanisms, competition for resources, mismatched timescales for EbA implementation, and limited willingness to share data and expertise
- Other barriers, especially cross-sectoral antagonisms (e.g. housing, climate change, and EbA), and trade-offs between EbA and other measures.

The main catalysts are:

- Policy-related catalysts, including transnational declarations of intent; mainstreaming EbA in national legislation; transboundary EbA strategies and memorandum of cooperation; and strong national policies relating to climate change.

- Network-related catalysts, including cross-sectoral and task focused working groups involving different public agencies; support and facilitation of grass root initiatives; support of CSOs and EbA-focused alliances involving the public and private sector; and transboundary networks that incorporate voluntary and proactive elements.
- Finance-related catalysts, including support for EbA related business platforms; partnerships between private foundations and public funded initiatives; partnerships between public funded initiatives at inter/transnational and national or regional level; leverage on green and intersectoral (e.g. water, agriculture and environment) funding; making the case for EBa financing in other sectors, such as infrastructure (moving from grey to green); EbA targeted financial incentives.
- Education- and knowledge-related catalysts, including strengthening of scientific transnational and multidisciplinary networks; EbA-related and project-focused training/internships in higher education institutions; and EbA virtual libraries and other on-line tools

The report identifies a set of key governance principles for EbA in MRG in five categories: flexibility (monitoring and evaluation; integration of scientific and traditional knowledge); multidimensional coordination (cross sectoral coordination; sharing of data and expertise; decentralization); co-design of solutions and public participation (task focused working groups, education;); law (dispute settlements; environmental law); and finance (PES, co-financing and other market instruments).

Latin American regionalization efforts

Progress on regionalizing MRG in the Andeas depends on the history of and experiences with regional approaches in general. Three case studies were examined to gain insights with respect to the different dimensions of the RGOS:

- Catamayo-Chira transboundary river basin (Ecuador-Peru). Key findings include: 1) It is mainly an inter-governmental platform involving national water authorities of Ecuador and Peru, regional governments and water councils; 2) It has progressively evolved from a technical approach focusing on productive capacity-building programs towards more scientific and institutional consolidation; 3) The Spanish Agency of International Cooperation for Development (AECID), and more recently PNUD/GEF, have played a central role in coordinating the binational cooperation even if they are still facing sustainability challenges; 4) The binational cooperation is strongly connected to the historical context of the 1998 Peace Agreement between both countries.
- Trinational Program of Conservation and Sustainable Development of the Protected Areas Corridor La Paya - Güeppi - Cuyabeno (Colombia, Ecuador, Peru). Key findings include: 1) It has a strong ecosystem-based and transboundary component, involving three national protected areas of Colombia, Ecuador and Peru; 2) While it is an inter-governmental initiative, the Program also largely includes the participation of indigenous peoples in the decision-making structures and the activities implemented; 3) The international cooperation support has been decisive in consolidating the

Program; 4) The Program is linked to the historical context of regional integration in the Amazon area.

- Latin American Technical Cooperation Network on National Parks, other Protected Areas and Wildlife (REDPARQUES). Key findings include: 1) Whereas the network is integrated by nineteen Latin-American countries, it has a strong ecosystem-based and transboundary spatial scope with various projects articulated around the Amazon biome; 2) The network is strongly articulated around ecosystem-based and climate change adaptation programs, in the framework of the Convention on Biological Diversity (CBD) at the international scale; 3) The wide territorial scope, as well as the technical character of the network, limit the effective participation of civil society and indigenous organizations in decision-making; 4) The support of international cooperation projects and funding, as well as international agreements and conventions, is decisive for the network sustainability.

MRG transition paths and scenarios

On the basis of the international MRG, EbA and Latin American regionalization cases, 2-3 transition path options (TPOs) are identified for each RGOS dimension (except funding instruments). Using pairwise comparison, the path dependence of 16 TPOs (influence of medium-term TPOs on long-term TPOs) are analyzed and then compared with medium-term and long-term stakeholder preferences expressed at the AMI-MC. The following matrices show, respectively, the outcome of the path dependence analysis of international MRG experience and the stakeholder preferences.

Path dependence analysis

		Dependency on medium-term TPOs (long term)		
		Low	**Medium**	**High**
Synergy potential (medium term)	**Low**		• T1: Ecoregional delimitation	• T2: Pluriregionality • SI1: Heterarchy • SI2: Polycentricity
	Medium		• IF1: Binding instrument • VI1: Strategic regional-national vertical integration	• IF3: Programmatic cooperation • VI2: programmatic regional-national-local integration • CSP2: Project implementation
	High	• CSP1: Agenda setting & policy making	• IF2: Declaratory framework instrument • SPI1: Independent scientific collective • SPI2: Demand-driven scientific input • EBA1: Policy catalysts • EBA3: Financial catalysts	• EBA2: Network catalysts

Stakeholder preferences

		Degree of consensus		
		Low	**Medium**	**High**
Strength of position	**Very low**	• Generalized CCA • Permanent scientific entity		
	Low		• Open participation by civil society	
	Medium	• Binding governance instrument • Ecosystems-based delimitation	• Multilevel cooperation	• High priority of CCA • Consultative role for CSOs

The two tables reveal that there are promising venues with regard to some options, while significant efforts will be required for others. On the one hand, both the path dependence matrix and stakeholder preferences point to a key role to be played by climate change adaptation, even if the degree of consensus on whether adaptation should be ecosystems-based or traditional is very low, almost evenly dividing the country delegates to the Ministerial consultation. On the other hand, aside from designating adaptation as a priority, where stakeholder consensus is medium or high, the respective transition path options do not rank very highly (synergistically) in the path dependence matrix, for instance for the role of civil society participation and the nature of vertical integration. Similarly, medium term transition path domains that rank highly in the path dependence matrix, such as the science-policy interface, do not elicit clear positions among stakeholders and/or are subject to a low degree of consensus.

An ideal scenario would be one that focuses on those approaches that rank highly in the path dependence matrix and the stakeholder preferences, where stakeholder consensus is high or medium and where the regional opportunity structure reveals past experience. As the preceding analysis shows, there are some approaches where this is the case but many where it is not. The implication is that no single scenario represents an easy way forward. This should not come as a surprise, as insights from MRG around the world demonstrate. Each and every approach to develop MRG entails intense and lengthy dialogue and negotiations between diverse stakeholders. Another way to look at it, however, is that dialogue may entail participation, knowledge exchange, and trust building, which generally has a positive influence on the sustainability of mountain range governance.

Three scenarios are proposed. Each has advantages and disadvantages, which are briefly outlined below. The three scenarios are not comprehensive but include the 4-5 approaches that would require the most attention in the medium term.

Scenario	Scenario priorities
Scenario 1: "Robust action" This scenario combines those approaches that are relatively present in both international experience and Andean stakeholder preferences.	• Declaratory framework instrument • Network-based climate change adaptation • Multilevel coordination • Civil society participation
Scenario 1: "International lessons" This scenarios weighs more heavily the results of the path dependence analysis of international experience	• Civil society participation • Demand-driven scientific input • Network-based climate change adaptation • Declaratory framework instrument
Scenario 3: "Andean vision" This scenarios weighs more heavily the results of the stakeholder consultation	• High priority of adaptation • Consultative CSO role • Multilevel cooperation • Ecosystems-based delimitation • Binding instrument

Abbreviations

ACT	Amazon Cooperation Treaty
ACTO	Amazon Cooperation Treaty Organization
AEA	Andean Environmental Agenda
AECID	Spanish Agency of International Cooperation for Development
ALFA	Latin-American Alliance to strengthen Protected Areas
AMI / IAM	Andean Mountain Initiative / Iniciative Andina de Montañas
ANA	National Water Authority (Peru)
AR	Assessment Report (of the → IPCC)
CAN	Andean Community of Nations
CBD	Convention on Biological Diversity
CBFT	Centro Binacional de Formación Técnica (Peru and Ecuador)
CCA	Climate change adaptation
CELAC	Community of Latin American and Caribbean States
CIPRA	International Commission for the Protection of the Alps
CONDESAN	Consorcio para el Desarrollo Sostenible de la Ecoregion Andina
CRHC	Water Resources Council of the Chira-Piura Basin (Peru)
CSO	Civil society organization
DRR	Disaster risk reduction
EbA	Ecosystem-based adaptation
ETC	European territorial cooperation, better known as Interreg
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GCF	Global Climate Fund
GEF	Global Environment Facility
GEO	Group on Earth Observations
GEO-GNOME Mountain	GEO Global Network for Observation and Information in Environments
GIZ	German Corporation for International Cooperation
GWI	Global Water Initiative
HKH	Hindu Kush Himalaya
IAPA	Integration of Amazon Biome Protected Areas
ICIMOD	International Centre for Integrated Mountain Development
INTERREG	see ETC
IPCC	United Nations Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
MRG	Mountain range governance
MRI	Mountain Research Initiative
NBS	Nature-based solutions
OPCC	Pyrenees Climate Change Observatory

OCTA	see ACTO
PATSAP	Pamir-Alai Transboundary Strategy and Action Plan
PES	Payments for Ecosystem Services
REDD	Reducing Emissions from Deforestation and Forest Degradation
REDPARQUES	Red Latinoamericana de Cooperación Técnica en Parques Nacionales, otras Áreas Protegidas, Flora y Fauna Silvestres
S4C	Science for the Carpathians
SDC	Swiss Agency for Development and Cooperation
SENAGUA	National Water Secretary of Ecuador
SFDRR	Sendai Framework for Disaster Risk Reduction
SMD	Sustainable Mountain Development
SNC-mt	Scientific Network for the Caucasus Mountain Region
SROCC	IPCC *Special Report on the Ocean and Cryosphere in a Changing Climate*
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WANI	IUCN Water and Nature Initiative
WWF	World Wildlife Fund

1. Context and objectives

Regional cooperation in transboundary mountain ranges has a long history. Over the course of the past three decades, a wide range of institutional arrangements and practices have emerged at the interface of a shared global mountain agenda and the particular regional opportunities and constraints of participating actors. Regional mountain initiatives are also influenced by a historical context shaped by the rise and fall of international treaty making and the appearance of alternative forms of governance. While promoters of regional mountain governance initiatives can draw on a rich variety of experiences, the paths to be forged must be the outcome of dialogue, negotiation and commitment of the concerned parties.

The goal of negotiating an international treaty to protect the European Alps was explicitly formulated by an NGO in 1952; subnational governments from the mountainous regions of European countries created "working communities" in the 1970s–1980s to promote knowledge exchange and cooperation; and in 1991 – prior to the adoption of Agenda 21 and its Chapter 13 on Sustainable Mountain Development (SMD) – Alpine countries and the European Community signed the Alpine Convention as the first intergovernmental treaty for sustainable mountain development.

Mountain range governance (MRG) soon emerged in other parts of the world, using a wide range of institutional setups and practices at the interface of a shared global mountain agenda and particular regional opportunities and constraints. Today, MRG promoters can draw on a rich variety of experiences, yet the paths to be forged must be the outcome of dialogue, negotiation and commitment of the concerned parties.

The objective of this background document is to support and accompany this process by providing a brief overview of core elements of an institutional setup to be considered. The document contributes to the UN Environment project Accelerating Climate Action under Euroclima+; it was elaborated by the University of Geneva's Institute of Environmental Governance and Territorial Development, with inputs from the Mountain Research Initiative.

2. What makes mountain governance work?

Contemporary policy making is widely inspired by the notion of adaptive governance, which aims to promote continual learning and adaptation in response to experience over time while being embedded in an institutional context that provides continuity. For more than twenty years, scholars and practitioners have recommended that international development efforts be reoriented to cope with the inevitable uncertainty and complexity of the development process. They suggest that one of the most promising ways to achieve this is to focus on adaptive approaches that incorporate strategic planning, administrative procedures that support innovation, responsiveness and experimentation, and decision-making processes that combine learning and action. The most effective approaches are suggested to be ones devised not to be optimal for a best estimate future, but robust across a range of futures.

2.1 Assessment framework

The assessment of MRG initiatives applies these insights through the lens of three concepts.

2.1.1 Analytical concepts

Contemporary policy making is widely inspired by the notion of adaptive governance, which aims to promote continual learning and adaptation in response to experience over time while being embedded in an institutional context that provides continuity. For more than twenty years, scholars and practitioners have recommended that international development efforts be reoriented to cope with the inevitable uncertainty and complexity of the development process. They suggest that one of the most promising ways to achieve this is to focus on adaptive approaches that incorporate strategic planning, administrative procedures that support innovation, responsiveness and experimentation, and decision-making processes that combine learning and action. The most effective approaches are suggested to be ones devised not to be optimal for a best estimate future, but robust across a range of futures.

The assessment of regional mountain governance initiatives applies these insights through the lens of three concepts.

Regional governance opportunity structure (RGOS)

Opportunities for coordinating across borders in pursuit of sustainable mountain development depend on a number of characteristics of the institutional setup. The following features of Regional mountain governance initiatives around the world are qualitatively assessed:

- Territoriality: spatial scope of the initiative, both in terms of the members' jurisdiction and the spatial ambit of the arrangements;
- Institutional formality: degree of juridification, or informality, and means of enforcement;
- Sectoral integration: number of sectors and institutional mechanisms linking them;

- Vertical coordination: diversity and nature of involvement by governmental actors at different levels, as well as acceptance of and mechanisms for applying subsidiarity (multilevel governance);
- Civil society participation: degree and nature of involvement of non-governmental organizations and the private sector;
- Science-policy interface: nature of institutional mechanisms for bilateral exchange between policy makers and scientists;
- Funding arrangements: assessment of funding sources (and diversity) and outlays, to the extent that information is available; and
- Climate change related ecosystem-based adaptation: treated separately due to the rarity of explicit EbA mainstreaming to date, this feature is included here to incorporate those examples that are known.

Institutional Fit

In order to assess the institutional fit of a particular arrangement for regional mountain governance, the *internal* dimensions of the regional governance opportunity structure have to be assessed against characteristics that are *external* (though inextricably linked) to a given arrangement. These include, inter alia:

- Global and regional integration trends: this includes specific conditions shaped by global treaties or initiatives (e.g. UNFCCC or the Sendai Framework) and/or regional cooperation frameworks (e.g. the European Union);
- Levels and diversity of socio-economic development of participating countries;
- Regional (geo)political climate, including history of regional and/or subregional cooperation; and
- Problem structure: nature and distribution of sustainable development challenges in mountain areas.

Transition paths

The third pillar of the assessment framework addresses the temporal dimension in terms of the length and nature of stages of the regional governance cycle, as well as the nature of institutional change over time (e.g. progressive development, punctuated equilibrium, arrested development, diversion, collapse).

2.2 Empirical scope of the assessment

The global assessment consists of two parts: (1) past and current international governance arrangements in the following mountain regions: Pyrenees, Jura, Alps, Carpathians, Balkan Mountains and Dinaric Arc, Caucasus, Central Asia, Himalayas, East Africa, and Rocky Mountains; (2) past and current regional governance arrangements in the Andean region.

These are analyzed according to the concepts identified in 2.1 and illustrated with specific institutional examples, including EbA integration; where relevant, prominent regional EbA initiatives outside of mountain areas may be included in the final assessment.

For the case studies of Latin American regionalization initiatives, the following criteria were taken into consideration:

- Inclusion of Ecosystem-based adaptation mechanisms;
- Interest of the countries expressed during the Ministerial consultation in Quito (19-20 November 2018;
- Diversity of initiatives in terms of formal/informal character and operational/binding agreement in short and medium-term;
- Diversity of spatial scope in terms of Andean or regional cases in Latin America, and mountain and non-mountain focus.

2.3 Assessment approach

The regional governance opportunity structure constitutes the central framework around which the assessment is carried out.

2.3.1 Sources and methods

The assessment of regional mountain initiatives around the world, EbA mainstreaming, and regionalization efforts in Latin America draw on a variety of sources. For the most part, it is based on existing materials such as scientific publications, official reports, internet sites, and grey literature; expert interviews were carried out where gaps exist (see Annex 3 for the EbA analysis).

Cases for the international MRG experience were selected on the basis of the author's prior knowledge and work.

The EbA analysis was based on an extensive search to identify case studies, including the canvassing of six different databases (see Annex 3). Through the combination of desktop research (with criteria/key words: ecosystem-based adaptation, transboundary, mountain and governance, in Scopus, Web of Science and Google Scholar), and expert consultation, a sample of 18 cases relevant for transboundary EbA mountain governance was identified; the four cases that fit the inclusion criteria most closely were selected for in-depth analysis, while the others served illustrative purposes of specific elements.

Latin American regionalization cases were identified in consultation with CONDESAN.

The assessment of fit incorporates information gathered in the context of the Andean Mountain Initiative consultation held in November 2018. The methodology for collecting feedback was developed by UniGE and MRI and based on a half-day session organized to this effect (see Annex 4).

2.3.2 Analysis

The analysis resulting from the assessment takes the form of a series of "fitness matrices" permitting the identification of feasible institutional options that are robust across a set of combinations of internal and external features and best correspond to the opportunities and constraints faced by the interested parties. While the analysis is inspired by recent work on SDG interdependence[1] on the one hand and the Analytical Hierarchy Process[2] on the other, the combination of analytical approaches used her is novel[3] and therefore contains an experimental character to be considered. Details about the analytical approach are provided throughout Sections 5 and 6.

The scenarios developed in the last section speak to possible institutional arrangements at the strategic and programme levels so as to include both "meta governance" issues and programmatic/operational questions with regard to EbA. They incorporate some degree of institutional innovation, yet are based on the recognition that adaptive governance/policy making is most effective when embedded in a larger institutional framework that guarantees a minimum degree of longitudinal stability.

3. Insights from mountain governance around the world

3.1 Overview of mountain range governance profiles

3.1.1 Europe

Alps

Shared by eight European countries, regional cooperation in the Alps also began through informal "working communities" established, respectively, in 1972, 1978, and 1982 for the central, eastern, and western Alps. Six Alpine countries and the European Community signed the Alpine Convention in 1991 (Slovenia and Liechtenstein joined within three years), an intergovernmental agreement consisting of a framework convention and ten protocols; not all countries have ratified all protocols. As in the case of the Pyrenees and the Jura, an Interreg programme has funded projects since the late 1990s. Stemming in part from need to better coordinate the multiple programs and agreements covering the Alps, the "macro-regional" European Strategy for the Alpine Region (EUSALP) was adopted in 2015, providing an overall strategic framework for policy alignment and institutional coordination. The International Scientific Committee on Research in the Alps (ISCAR) was created in 1999 and is an official observer of the Convention.

Carpathians

The Carpathians are a mountain region shared by Czech Republic, Slovakia, Poland, Hungary, Ukraine, Romania, and Serbia. Together with the Alps, the Carpathians are the only other

[1] For example Weitz *et al* (2017), Wymann von Dach *et al* (2018).

[2] For example Saaty (1980).

[3] But see Abildtrup *et al* (2006) for an application of pairwise comparison to scenario development.

mountain region that has an intergovernmental treaty focused specifically on the mountain region. The Carpathian Convention was signed in 2004, a process strongly supported by UNEP, which continues to host the Convention's Secretariat. The Convention follows the same pattern as the Alpine Convention, with a framework Convention accompanied by thematic protocols (to date, protocols for biodiversity, tourism, and transport have been signed). Many activities in support of the objectives of the Carpathian convention are funded under an INTERREG programme as well as numerous European research projects. A regional network of scientists called Science for the Carpathians, established with the support of the Mountain Research Initiative, maintains a close relationship with the Convention Secretariat.

Balkan Mountain/Dinaric Arc

Efforts to negotiate a mountain convention for the Balkan Mountains/Dinaric Arc (12 countries in different subregional constellations) evolved in parallel to those in the Carpathians and the Caucasus (see below), also with strong support and guidance from UNEP. Yielding a number of high-level events, the process culminated in 2006 with the adoption of a draft framework convention at an intergovernmental meeting. A final agreement was never signed, as the countries' priorities changed, in part as a result of EU accession. A regional network of scientists called Southeastern Europe Mountain Research (SEEMore), similarly established with initial support from MRI, has periodically organized regional meetings and developed thematic priorities for research.

Pyrenees

Shared between Spain, Andorra and France, the Pyrenees are a small mountain region, where transnational cooperation began in the form of an informal working community of subnational governments in 1983. Cooperation has been formalized since 1990 in the context of the EU INTERREG programme *Programme Opérationnel de Coopération Transfrontalière: Espagne-France-Andorre*. The Pyrenees Observatory of Climate Change provides data and information at the regional level.

Jura

Shared between Switzerland and France, the Jura is a small mountain region, where transnational cooperation began in the form of an informal "working community" of subnational governments, established by means of an international agreements between the two countries signed in 1985. Cooperation was formalized through a charter signed in 1993 by the region's subnational governments and strengthened in 2001 through the formal integration of the French and Swiss central governments. As in the case of the Pyrenees, a transnational EU INTERREG program between France and Switzerland (despite not being a member) has provided funding to project activities in the Jura. A regional observatory was created by the countries' statistical offices to provide regular data and knowledge about the mountain region.

Caucasus

Until 2007, negotiations for a mountain convention modeled after the Alpine Convention involved Armenia, Azerbaijan, Georgia, Russia, and later Iran and Turkey; the process was strongly supported by UNEP, in collaboration with the Georgia-based Regional Environment Centre. A draft framework convention was ready to be signed in 2004, alongside the Carpathian Convention, but a last minute reversal, followed by the 2008 war between Russia and Georgia ended the political effort. Regional cooperation has since focused on scientific exchange through the Scientific Network for the Caucasus Mountain Region (SNC-mt) established in 2013 and the Caucasus Mountain Fora SNC-mt has organized in 2016 and 2019.

3.1.2 Asia

Himalayas

The Hindu Kush Himalaya (HKH) region is shared by eight countries – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and home to 240 million people. As politically volatile as the Caucasus, regional cooperation has centered on the International Centre for Integrated Mountain Development (ICIMOD), founded in 1983 with the governments of Switzerland and the Federal Republic of Germany as well as UNESCO (under the framework of the Man and the Biosphere Programme) as founding sponsors. ICIMOD has focused on knowledge generation and exchange but also supports cooperation efforts, mostly through scaling up management innovation or implementing river basin and transboundary landscape conservation at the subregional level. Over the last two years, mountain-focused regional cooperation has also emerged in the context of the One Belt One Road (OBOR) initiative.

Central Asia

Unlike most other mountain regions, the mountains of Central Asia comprise several ranges, including most prominently the Pamir (Tajikistan, China, Afghanistan, Pakistan, Kyrgyzstan) and Tien Shan (China, Kazakhstan, Kyrgyzstan, Tajikistan). Accordingly, MRG initiatives are fragmented and do not specifically address mountains. For example, the Framework Convention on Environmental Protection for Sustainable Development, signed in 2006 by Kyrgyzstan, Tajikistan, and Turkmenistan addresses mountain ecosystem degradation as one of five priority areas. A number of community-based transboundary initiatives have emerged with the support of donors such as the Swiss Agency for Development and Cooperation (SDC), including the Central Asian Mountain Partnership (present in Kyrgyzstan, Tajikistan, and Kazakhstan), which was instrumental in the creation of the Alliance of Central Asian Mountain Communities, and the Pamir-Alai Land Management project (Tajikistan and Kyrgyzstan). The University of Central Asia, founded in 2000 as a private, not for profit, secular university through an treaty between the Kyrgyz Republic, Tajikistan, and Kazakhstan, and His Highness the Aga Khan, is a focal point for knowledge generation. As in the case of the HKH, the OBOR initiative is increasingly active in Central Asia.

3.1.3 Africa

East Africa

East Africa has some of the continent's most prominent mountains, including Mount Kilimanjaro, Rwenzori, Virunga, Kenya and Elgon, as well as highland regions such as the Ethiopian Highlands and the East Africa Arc. Mountain-related governance is fragmented across different regional and subregional (non-mountain) orders, including the East African Community (Burundi, Kenya, Rwanda, Tanzania, Uganda, South Sudan), the Common Market for Eastern and Southern Africa, and the Intergovernmental Authority on Development. The EAC has adopted a number of instruments relevant for its mountain regions, especially the East African Community Protocol on Environment and Natural Resources Management, the East African Climate Change Policy, and the East African Community Transboundary Ecosystem Management Act of 2010. Since 2014, the Africa Regional Mountains Forum has constituted a focal point for scientists and practitioners; the second AMF was organized in 2018. The Albertine Rift Conservation Society (ARCOS Network) has been a key actor in mobilizing attention to and action on SMD in Africa.

3.1.4 North America

Rocky Mountains

Shared between Canada and the United States of America, the largely mountainous terrain of the Greater Yellowstone Ecosystem is the focus of the so-called Yellowstone to Yukon (Y2Y) initiative. Strong in symbolic terms and recognized as one of the world's premier "large landscape" conservation initiatives, Y2Y has a comparatively weak level of institutionalization. It emerged in 1993 as a network of academic and non-governmental conservation scientists and activists. During the 1990s, participation in Y2Y involved a large Y2Y Council and a smaller Y2Y Coordinating Committee, which evolved into a Board of directors in 2004 and thereafter into a more formal organization with staff, trustees, and consultants. In parallel, Y2Y developed a strategic planning process and a climate agenda. Today, the Y2Y Conservation Initiative is a not-for-profit organization registered both in Canada and the U.S.A.

3.2 Institutional features of the regional governance opportunity structure

For ease of navigation, the following table provides an overview of the institutional features highlighted in the text below.

Table 1: Examples of selected institutional features in MRG

	Pyr	*Jur*	*Alp*	*Car*	*Bal*	*Cau*	*Him*	*CA*	*EAf*	*Y2Y*
Territoriality			x	x						x
Formality	x	x	x	x						
Cross-sectoral integration	x	x	x	x	x	x				x
CSO participation						x		x	x	x
Science-policy interaction	x	x		x		x	x	x		
Climate change adaptation			x				x		x	

Pyr: Pyrenees; Jur: Jura; Alp: European Alps; Car: Carpathians; Bal: Balkans/Dinaric Arc; Cau: Caucasus; Him: Himalayas; CA: Central Asia; EAf: Eastern Africa; Y2Y: Yellowstone to Yukon Initiative.

3.2.1 Territoriality

Since transboundary mountain ranges do not coincide with state borders, efforts to delineate mountain regions are often the focus of considerable scientific and political attention. Where inclusion within the spatial scope of a MRG initiative has formal implications, such as legal applicability or as eligibility for funding, formal delineation is a necessary feature of MRG. On the one hand formal delineation often corresponds to the jurisdictional logic of non-mountain programs (e.g. the European Union's INTERREG program), which can clarify funding eligibility questions and facilitate data gathering; on the other hand, even subnational jurisdictional units often include highland and lowland areas, thereby rendering the monitoring of a mountain range as an ecosystem difficult.

***Example 1:** Alpine Convention*

Article 1.1 of the Framework Convention of the Alpine Convention states that the "Convention shall cover the Alpine region, as described and depicted in the Annex". Although the Annex is actually difficult to find, the spatial scope is known to follow municipal boundaries and closely follow the boundaries of the mountain range. By contrast, the spatial scope of the Alpine Space Program and EUSALP is much larger and includes not only large lowland areas but also large metropolitan centers such as Munich, Turin and Milan. Here, the politically contentious issue concerns the uneven political clout of large extralpine cities (and their voters) compared to the less populous upland regions.

***Example 2:** Carpathian Convention*

In contrast to the Alpine Convention, the Carpathian Convention does not specify a spatial scope. Article 1.1 of its Framework Convention simply states that the "Convention applies to the Carpathian region [...], to be defined by the Conference of the Parties"; Article 1.2 adds that "Each Party may extend the application of this Convention and its Protocols to additional parts of its national territory by making a declaration to the Depositary, provided that this is necessary to implement the provisions of the Convention." In light of progress achieved by

the signatories to the Convention, the lack of a clear spatial delineation has clearly not been a major problem.

***Example 3:** Yellowstone to Yukon Initiative*

Of all the MRG initiatives, the Y2Y most closely follows an ecosystems boundary; the Y2Y website describes it as "one of the last intact mountain ecosystems left on Earth." Yet that boundary was not always stable, as it expanded significantly during the early years with the growing number of Y2Y participants. Furthermore, while the 1998 *Y2Y Atlas* used the term ''ecoregion'' in its subtitle, it referred to the ecoregion as "something of an artificial construct" and suggested that the boundary on the maps should not be interpreted as a sharp delineation based on a crisp ecological difference, but rather as a permeable membrane, through which animals, rivers, and ecological processes cross continually."[4]

=> The delineation of a mountain range for the purpose of MRG is important for many reasons, but experience shows that its absence (or lack of scientific consensus) need not be an obstacle to regional cooperation; ICIMOD's approach in the Hindu Kush Himalaya (HKH) region is another example.

3.2.2 Institutional formality

Mountain range governance agreements have operated with very different degrees of formalization, ranging from legally binding international treaties to loosely organized networks of interested actors. The former offers a structured approach to MRG with a clearly defined legal status, clear roles (e.g. parties to the agreement, secretariats, observers), lines of accountability (e.g. decision making authority, reporting responsibilities), sometimes budgetary resources and r(e)distribution mechanisms, and continuity; however, international treaties take time and resources to negotiate, can be slow in adapting to new circumstances and responding to new priorities, and have a tendency to focus on lowest common denominators. The latter can be flexible setups that easily accommodate diverse stakeholders, but they can be less stable over time in part due to difficulties in resource mobilization.

***Example 1:** Working communities*

So-called working communities emerged in the 1970s and 1980s in several European mountain regions. With the strong support for cross-border cooperation by the Council of Europe, these working communities brought together subnational governments seeking to cooperate on a range of issues, often with a cultural and socioeconomic focus yet with no power other than to issue recommendations to the respective governments. From 1980, the Madrid Convention provided a legal framework for the establishment of cross border regions, further strengthened with the introduction in 2006 of the European Grouping for Territorial Cooperation, which made it possible for cross-border cooperation bodies to obtain legal person. Working communities such as Arge Alp for the eastern Alps continue to exist and have played an important role in fostering alpine cooperation.

[4] Willcox (1998).

***Example 2:** Alpine and Carpathian Conventions*

The Alpine and Carpathian Conventions are the two only existing intergovernmental treaties specifically addressing mountains; one consequence is that subnational governments have no legal standing under international public law and are therefore relatively marginalized in the conventions' formal processes. Both conventions follow a framework-protocol model, a well-known approach in international environmental cooperation (e.g. for biodiversity and climate change). The main difference between the two is that in the case of the Alpine Convention, most of the protocols were developed and negotiated at the same time as the framework convention, while a more demand-driven process has been observed in the Carpathians. Because some signatories to the Alpine Convention have long ratified some protocols, the possibility of amending to ease ratification by laggard states is small, which has created deadlock on several key issues. Both conventions are legally binding, but as is often the case, compliance and enforcement mechanisms are weak. On the other hand, the conventions have been used by a range of non-state actors to remind central governments of their commitments.

=> Although the Alpine Convention has served as inspiration for several MRG initiatives (the draft conventions for the Caucaus and the Dinaric Arc were essentially carbon copies), only one other treaty has been concluded to date. This does not mean that MRG has been ineffective elsewhere, as more action-oriented MRG has often appeared as a more flexible, albeit less stable approach.

3.2.3 Sectoral integration

Just as the concept and practice of sustainable development has evolved since the late 1980s, the sectoral orientation of sustainable mountain development has changed over time.

Table 2: Sectors addressed in MRG initiatives[5]

	Alps[1]	Pyrenees[2]	Jura[3]	Carpathians[4]	Balkan Mountains[5]	Dinaric Arc[6]	Caucasus[7]
Nature	x	x	x	x	x	x	x
Agriculture	x		x	x	x	x	x
Forestry	x		x	x	x	x	x
Tourism	x	x	x	x	x	x	x
Land use planning	x	x		x		x	x
Urban development			x				
Energy	x		x	x	x	x	x
Soils	x						x
Transport	x	x	x	x	x	x	x
Culture	x	x	x	x	x	x	x
Health			x				
Social policy			x				
Air pollution	x				x		x
Water	x			x	x	x	x
Waste	x				x		x
Climate	x			x			
Economy/Training		x	x				
Communication/ICT			x				
Research		x	x		x		
Sports		x				x	
Mining					x		
Total	13	8	13	10	12	10	12
Rank	1	4	1	3	2	3	2

[1]Alpine Convention, Protocols, and Declarations as well as Alpine Space Programme priorities; [2]Objectives of the Communauté de Travail des Pyrénées; [3]Convention Communauté de Travail du Jura; [4]Carpathian Convention and Protocols; [5]Draft Framework Convention for the Protection and Sustainable Development of Mountain Regions of Southeast Europe; [6]Ministerial Resolution concerning the Sustainable Development of the Dinaric Arc Region; [7]Draft Convention for the Protection of the Caucasus Mountain Ecosystem.

The integrative dimension of sustainable development remains at its core. While core sectors such as nature conservation, agriculture, and tourism continue to be important, climate change adaptation has assumed a central place and now appears as a cross-sectoral driver in its own right (see below).

Table 2 gives an overview of sectors addressed in MRG, based on agreed or draft instruments of cooperation. Means to ensure sectoral integration vary widely, ranging from simple

[5] From Balsiger & Nahrath (2015).

reference to the integrative nature of sustainable mountain development to the establishment of cross-cutting working groups or special projects.

=> Nature, tourism, transport and culture as priority areas are cited in each MRG initiative, followed by agriculture, forestry, and energy. This does not mean that all of these are actually implemented everywhere (even in those initiatives that do have implementation), as there are clear trade-offs between breath, depth, effectiveness, and political feasibility.

3.2.4 Civil society participation

Civil society organizations CSOs have played significant roles in MRG initiatives as initiators, key MRG service providers, sources of knowledge and expertise, promoters of interregional exchange, or watchdogs. The degree to which CSOs are integrated in decision-making structures depends to a large extent on the degree of MRG formalization (see above), the nature of prevailing state-society relations, and the level of CSO professionalization. In some cases, CSOs have sought formal association and obtained observer status in intergovernmental treaties, in other cases they have consciously sought to keep at a distance from governmental actors. In many mountain ranges, CSOs have formed networks to create political leverage, foster the exchange of experiences, provide a link between MRG processes and CSO network members.

Example 1: Caucasus

Civil society organizations have played a key role in fostering regional cooperation in the Caucasus. The Regional Environmental Centre for the Caucasus (RECC), a regional NGO was the focus of coordination, in collaboration with UNEP, during the phase when a mountain convention was negotiated. The founding charter of RECC was signed in 1999 by Azerbaijan, Armenia, Georgia and the European Union; RECC was formally registered as an NGO in Georgia in 2000. At present, regional cooperation is promoted in important ways by another Georgia-registered NGO, the Caucasus Network for Sustainable Development of Mountain Regions.

Example 2: Yellowstone to Yukon

The Yellowstone to Yukon Conservation Initiative was initiated by a network of academic biologists, conservation advocates from small and large CSOs from the Y2Y region, and conservation thinkers from CSOs and environmental foundations living in the US or Canada but outside Y2Y region.[6] Professionalization was very gradual, in part because of internal debate about the need (and fear by some) to become a more formal organization. Although Y2Y has developed working relations with public authorities, especially national park managers, it has kept a distance from governmental processes.

Example 3: Alpine and Carpathian Conventions

The nature of CSO participation in the Alpine and Carpathian Conventions is similar. CSOs such as WWF, Euromontana, and the International Commission for the Protection of the Alps (CIPRA) are official observers of the Alpine Convention (alongside working communities

[6] Chester (2015).

mentioned above, as well as scientific organizations) and members of these and other organizations are active participants in the Convention's working groups. In the Carpathian Convention, CSOs are open to participate in the working groups but do not have formal observer status in the intergovernmental proceedings. Instead, the Carpathian Convention has entered a series of "official partnerships" by means of memorandums of understanding, though CSOs. In the case of the Alps, several rangewide CSO networks have emerged and CSOs regularly participate in projects funded by the Alpine Space Programme and to some degree the EUSALP.

Example 4: East Africa

Among CSOs in East African MRG, the ARCOS Network has been the most active. ARCOS is a regional organisation, registered as a charity in the UK as an international NGO in Rwanda and Uganda. ARCOS has established partnerships with governments to support SMD efforts and has been a key organizer of the African Regional Mountains Forum. As a network, ARCOS members are mostly specialized groups and alliances working in conservation and development; its members include local to international organizations as well as individuals.

3.2.5 Science-policy interface

Scientists often provide important inputs for MRG initiatives and so-called scientific collectives exist in almost all mountain regions. Four general types of scientific collectives can be identified: (1) Collectives of specialized scientists established independent of regional governance projects, (2) scientific collectives established to serve as counterparts of existing political projects of regional governance, (3) Type 3: scientific collectives organized to be the academic counterparts of planned or abandoned political projects of regional governance, and (4) Techno-scientific collectives established to meet specific data needs of regional governance institutions.[7]

Example 1: Himalayas (Type 1)

ICIMOD is the premier example of a type 1 scientific collective. As a self-described "regional intergovernmental learning and knowledge sharing centre" ICIMOD serves its eight member countries from the HKH region. With well over 200 staff, ICIMOD has six programme areas: Adaptation and Resilience Building; Transboundary Landscapes; River Basins and Cryosphere; Atmosphere; Mountain Environment Regional Information System; and Mountain Knowledge and Action Networks. While ICIMOD seeks to promote policy processes, knowledge creation has been its core business.

Example 2: Carpathians (Type 2)

Science for the Carpathians (S4C) was created in 2008 as a network of individual scientists working in/on the Carpathian Mountains. Every two years, S4C organizes the Forum Carpaticum, a regional gathering of scientists and (far fewer in number) practitioners and policy makers. S4C has developed a regional resarch agenda to identify knowledge gaps. It has an official partnership with the Carpathian Convention, but the research agenda and

[7] Debarbieux *et al* (2014).

Convention work are not systematically aligned. Since S4C lacks a legal status, the Carpathian Convention typically works with the home universities or research institutes of selected S4C members or non-S4C experts.

***Example 3:** Pyrenees and Jura (Type 4)*

The Pyrenees Observatory for Climate Change and the Transboundary Statistical Observatory of the Jura Arc are typical type 4 organizations. Both were originally formed in the context of INTERREG programmes but have become independent data and information providers with diverse project portfolios and funding sources. These scientific collectives inform MRG processes but do not formally participate in them.

=> Scientists and scientific organizations vary widely with respect to how they organized, what types of regionality they espouse, and how functions they fulfill vis-à-vis MRG processes. In turn, prevailing MRG processes shape the ways in which scientists operate at the science-policy interface. At a broader level, the nature of scientific participation in MRG also depends on the recognition afforded to science and scientists in the respective socio-cultural contexts and, the level of funding available for basic and applied research, as well as the level and nature of competition in the knowledge market.

3.2.6 Climate change

Climate change mitigation and adaptation have become important issues in MRG around the world. Yet human-induced climate change is only one driver of change in mountain regions, others being related to broader political transformation; the role of mountain regions in terms of the presence or absence of mountain policy, the leverage of mountain populations, and the constitutional status of mountainous subnational entities; and socioeconomic developments, especially with respect to exposure, for better or worse, to global markets for goods and services.

***Example 1:** Alps*

Although climate change mitigation or adaptation is not subject to a protocol of the Alpine Convention, the Energy and Mountain forests Protocols mention climate change and the issue has been on the political agenda for a long time: in 2006 the Parties to the Convention adopted the Declaration on Climate Change; in 2009 they approved an Action Plan and since 2011 climate change is a priority in the multi-annual work programme (MAWP). In 2016, the Alpine Conference reiterated it as one of the six priorities of 2017-2022 MAWP and decided to establish an Alpine Climate Board designed to coordinate existing initiatives and contributions and to develop objectives towards a "climate-neutral Alpine space." A stock-taking exercise carried out in 2017 identified 100 climate change related activities by Parties to the Convention, many of the carried out in the context of the Alpine Space Programme, EUSALP, and Horizon 2020 research projects. Several examples relate to institutionalized activities such as the Alpine Pearls network, a collaboration of climate adaptation policy makers, or the Alpine Climate Partnership, a new network of Alpine municipalities.

***Example 2:** Himalayas*

A "focus on the need for scientific data, informed policymaking and effective adaptation to climate change" is a "crucial component of ICIMOD's work."1 In this respect, ICIMOD has implemented a number of programs, including AdaptHimal (implemented in Bangladesh, India, Myanmar, and Nepal with different IFAD investment/loan projects and technical agencies); HICAP (partnership with CICERO and GRID-Arendal initiated in 2011 to address critical knowledge gaps on water, climate and hydrology in five major Himalayan river systems); and Himalica (EU-funded project from 2012-2018 to support rural livelihoods and climate change adaptation). At present, the major initiative is the Himalayan Monitoring and Assessment Programme HIMAP (inspired by the success of the Arctic Monitoring and Assessment Programme AMAP), a comprehensive climate change impact assessment for the entire Himalayan region.

=> Not surprisingly, climate change has become a significant dimension of MRG initiatives, as evidenced by the series of regional/subregional reports commissioned by UNEP in preparation for the UNFCCC COP 21 in Paris. The IPCC's work is an additional trigger of increased update of climate change in MRG: not only do the *Special Report on the Ocean and Cryosphere in a Changing Climate* (SROCC, adopted in September 2019) and the approved outline for the AR6 Working Group II report include a specific emphasis on mountains, motivating scientifists to respond to the assessment request, several donors have started addressing knowledge gaps with specific funding programs.

Most MRG initiatives have added climate change as a priority. The means by which this has been done varies, with no scenario emerging as a clear best case approach. A key question to be addressed for newly emerging MRG initiatives is whether SMD should subsume climate change adaptation (including EbA) or whether climate change adaptation should become the overall framework withing which priority SMD issues are addressed.

4. Mainstreaming ecosystem-based adaptation

Ecosystem-based approaches have the potential for successfully integrating multiple priorities and delivering multiple benefits for sustainable development, disaster risk reduction, and climate change mitigation and adaptation (Estrella et al. 2016). An ecosystem approach is a strategy for the integrated management of land, water, and living resources that promotes conservation, sustainable use of resources and climate adaptation (CBD 2004). Ecosystems are protected as a means to adapt to climate change.

The key focus of this section is on ecosystem-based adaptation (EbA), which uses the range of opportunities for the sustainable management, conservation, and restoration of ecosystems to provide services that enable people to adapt to the impacts of climate change. It falls under the umbrella of nature-based solution that work with and enhance nature to support biodiversity and help address societal challenges (Seddon et al. 2019).

EbA aims at maintaining and increasing the resilience and reducing the vulnerability of people and ecosystems in the face of the adverse effects of climate change (CBD 2009: 41,

used also in WGIIAR5, see Glossary).[8] It involves the restoration and protection of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change (CBD 2009, 2014). Examples of EbA measures include: wetland and floodplain management to prevent floods and maintain water flow and water quality in the face of changing rainfall patterns; conservation and restoration of forests and natural vegetation to stabilize slopes and prevent landslides, and regulate water flows preventing flash flooding; establishment of diverse agroforestry systems to help maintain crop yields under changing climate (Reid et al. 2018).

Yet, the classification of EbA measures is still under debate. For example Warmsler and colleagues (2016) classify EbA measures according to their risk reduction approach: 1. hazard reduction to keep climate hazards away from communities; 2. vulnerability reduction to allow a community to live with hazards; 3. preparedness for response or recovery to cope with climate hazard impacts. Project-based fieldwork adopts much broader definitions of EbA measures including e.g. enhanced animal husbandry, rotational grazing and grassland plantation, improved livestock shed or plantation of drought-resistant seed varieties (Monty et al. 2016; Reid et al. 2019; Renaud et al. 2013; Renaud et al. 2016).

Furthermore, the criteria for identifying EbA measures are not yet clearly set. For example Dourojeanni and colleagues (2015) define EbA measures as those that reduce the population ´s vulnerability to climate change, directly or indirectly increase the resilience of biodiversity and ecosystem services, and use biodiversity and ecosystem services in a sustainable manner. Based on an extensive literature review Reid and colleagues (2019) identify key criteria for effective EbA including e.g. a human-centric approach, reliance on traditional knowledge, based on best available science, benefits for the world's poorest, community based and incorporating human rights based principles, cross-sectoral and intergovernmental collaboration.

Notwithstanding increasing evidence of the effectiveness of EbA for climate adaptation and disaster risk reduction (Renaud et al. 2019), there is a lack of governance and institutional arrangements that fit the purpose.[9] EbA necessitates cooperation and communication across multiple sectors and varying administrative and/or geographical scales (Reid et al. 2018).

Martinez-Hernandez (2019) lists a set of 16 key governance principles for EbA, divided in five categories:

i. *Flexibility* (1. Monitoring and evaluation; 2. Integration of science and traditional knowledge; 3. Innovation);

ii. *Multidimensional coordination* (4. Cross sectoral coordination; Multi-level coordination; 6. Decentralization);

[8] The glossary (Annex 1) provides a review of key terms related to ecosystem-based adaptation.

[9] It is important to note that EbA effectiveness also depends on the existence of effective mitigation practices (IPCC 2019). One key conclusion of the SROCC is that EbA measures are to expected to be more effective under low emissions scenarios, since certain ecosystem functions (and thus EbA effectiveness) are jeopardized under high emissions scenarios. In turn, less effective EbA will entail more costly and complex adaptation measures that also take their toll on governance arrangements.

iii. *Public participation* (7. Public participation; 8. Indigenous people rights; 9. Woman and vulnerable groups rights);

iv. *Ecosystem approach* (10. Ecosystem services for adaptation; 11. Disaster risk reduction; 12. Ecosystem´s carrying capacities); and

v. *Law and finance* (13. Capacities; 14. Finance; 15. Dispute settlements; 16. Environmental law).

Yet there is still a need to identify framework conditions, legal procedures, liability regimes, institutions, regulations, public-private processes, financial arrangements, and stakeholder engagement that can support the implementation of effective EbA governance models.

This section addresses these issues, with a specific focus on mountain range governance and the Andean region.

4.1 EbA and Eco-DRR/CCA in post-2015 global policy agreements

The post-2015 sustainable development agenda offers a number of opportunities for EbA and ECO disaster risk reduction and climate adaptation (see Glossary). The following table (based on Estrella et al. 2016) summarizes the key provisions on EbA, Eco-DRR/CCA in the post-2015 global policy agreements.

Table 3: Key EbA and Eco-DRR/CCA provisions in post-2015 global policy agreements[10]

Policy agreement	Key provisions on EbA, CCA and/or Eco-DRR	National level instruments
Sendai Framework on disaster risk reduction **SFDRR** (2015-2030)	Ecosystem degradation recognized as driver of risk. Sustainable management of ecosystems as a key measure for building disaster resilience. Role of ecosystems highlighted in Priority Action 1 (risk assessment), 2 (governance) and 3 (resilience). SFDRR calls for EbA in transboundary cooperation, e.g. for river basin management.	Eco-DRR/CCA should be mainstreamed across sectoral development plans, national and local strategies. Targets and indicators should be developed as appropriate.
Sustainable Development Goals **SDG** (2015-2030), also the SD agenda	A major pillar of SDG is taking urgent action on climate change. Sustainable ecosystem management and DRR are mentioned in SDGs 1, 2, 4, 9, 11 ,13, 15.	193 countries are developing their national SD strategies or national SDG frameworks, including indicators for each SDG target.
UNFCC 21st conference of the parties-Paris agreement on climate change	The agreement recognizes protecting the integrity of ecosystem for climate change mitigation and adaptation actions/building ecosystem resilience.	National adaptation planning enables countries to assess their vulnerabilities, mainstream climate change risks, and address adaptation. Green climate fund and climate technology center and network

[10] Based on Estrella et al. 2016

		support Eco-DRR/CCA projects.
Convention on Biological Diversity (CBD), 12th conference of the parties, decision XII/20	The CBD cites importance conservation and sustainable use of biodiversity and ecosystem restoration in climate change adaptation and mitigation. By 2020, target of restoration of at least 15% of degraded ecosystems, contributing to CCA (Decision XII/20)	Decision XII/20 advocates for a stronger role of ecosystem-based approaches in DRR strategies and national adaptation plans

***Example:** Mainstreaming EbA in EU policies, Europe*

Examples of how the EbA global policy agreements have been mainstreamed in European policies include the following:

1. There are a number of EU financing programs in relation to ecosystem-based adaptation such as LIFE +, the financing instrument for the Environment, the EU Cohesion Fund, and the European Agricultural Fund for Rural Development that support investment in NBS and EbA. These instruments have been used to mainstream EbA in national policies.
2. The European Commission revealed its strategy on Green Infrastructure in 2013 (EC, 2013), which incorporates disaster risk reduction as one of the major roles of the Green Infrastructure. To build on this, the Mid-Term Review of the EU Biodiversity Strategy to 2020 (adopted in 2015) called on the development of a trans-European network of green infrastructure by 2017 (Monty at al. 2016). Also the EU research framework "Horizon 2020" starting from 2014 has supported research topics related to Green Infrastructure, which includes Eco-DRR.
3. Concerning cross-border cooperation in the coastal region of the Mediterranean, the Barcelona Convention for the Protection of the Marine Environment launched a Sustainable Development Strategy for the Mediterranean (2016-2025). Among its objectives (Objective 4) there is the recognition and protection of the climate adaptation and mitigation services of natural ecosystems (Martinez-Hernandez 2019).

4.2 EbA and CCA in Mountain Range Governance

Climate change adaptation has assumed a central place and now appears as a cross-sectoral driver of MRG initiatives in its own right (Balsiger 2018). However, this does not appear to be true for EbA. This section provides an overview of how EbA and CCA have been addressed in already existing conventions (Carpathian and Alpine).

4.2.1 Carpathian Convention

The Carpathian Convention addresses climate change – with an emphasis on the role of ecosystems – as a key topic. More precisely Art. 12 bis[11] states:

> The parties, taking into consideration the vulnerability of fragile mountain ecosystems and exposure of key economic sectors and mountain communities to

[11] http://www.carpathianconvention.org/text-of-the-convention.html

climate change, and the key role mountains play for other geographical areas, shall:

(a) pursue policies aiming at climate change mitigation in all sectors relevant to the Convention having in mind their interactions,

(b) pursue policies aiming at climate change adaptation by promoting research and scientific cooperation, cross-sectoral integration, transnational cooperation, awareness raising, public participation and cooperation of all stakeholders, and foster local adaptation planning processes and the implementation of actions, especially in the most vulnerable areas and sectors, and,

(c) undertake integrated measures to reduce the risks and minimise the adverse effects of climate change, especially of extreme weather events.

In the Carpathian Convention there is also a working group on adaptation that mentions the vulnerability of water and ecosystems to climate change and adaptation in its mandate. Moreover the Carpathian Project under the INTERREG IIIB B CADSES Neighbourhood Programme produced a Report on water resources and natural disasters (climate change) and flood risk mapping (Walczykiewicz et al 2007).

4.2.2 Alpine Convention

Although climate change mitigation or adaptation is not subject to a protocol of the Alpine Convention, the Energy and Mountain Forests Protocols mention climate change and the issue has been on the political agenda for a long time: in 2006 the Parties to the Convention adopted the Declaration on Climate Change. In the initial work programmes climate change was included in the section "Nature and agriculture", but it gained more and more relevance over the years. In 2009 the Parties approved an Action Plan and since 2011 climate change has been a priority in the multi-annual work programme (MAWP).

In this document climate change is considered as one of the main threats to alpine ecosystems. Risk reduction and climate adaptation are identified as key priorities, together with exchange of good practices, knowledge and experiences, for the Alpine region to become an exemplary region for innovative adaptation plans. The development of approaches fostering intersectoral and long term solutions is a key priority. Climate mitigation is also considered an important component of the Alpine Climate Strategy with the objective to "pursue climate neutrality[12] and the 2000 watt society" (MAWP 2011-2016: 5). Specific attention in the MAWP 2011-2016 was placed on energy efficiency, renewable energy especially for the sectors of transport, tourism and building. Finally the document highlights that climate change is also an opportunity for the Alpine space, where an increase in temperatures may contribute to summer tourism and the production of new agricultural products.

[12] Climate neutrality can be achieved if CO_2 emissions are reduced to a minimum and any remaining CO_2 emissions are compensated with climate protection measures. If harmful greenhouse gases are completely avoided or already emitted gases are saved at another location, it is called "climate neutral" (https://www.myclimate.org/).

In 2016, the Alpine Conference reiterated climate change as one of the six priorities of the 2017-2022 MAWP and decided to establish an Alpine Climate Board designed to coordinate existing initiatives and contributions.

The 2017-2022 MAWP lists priorities for a number of road maps for a number of priorities; the adoption of measures against climate change is priority number 2. Many of the key points listed in MAWP 2011-2016 are repeated. The aim of reaching a climate neutral alpine region is reinforced, with a new temporal frame (by 2050). Green economy is included as a key aspect to reach climate neutrality and the same is true for multi-stakeholder and multi-sectoral engagement. Local authorities are considered key players, as also stated in COP 21 and the 2015 Paris Agreement both considered as key pillars of the strategy. Funding of climate research is also considered a key issue to address in order to develop smart adaptation and mitigation strategies.

The related list of actions include: i) a document on "Risk governance in the natural hazard context"; ii) promotion of activities (including conferences and architectural competitions such as "Constructive Alps") aimed at promoting energy efficiency, building of innovative and sustainable houses; iii)promotion of activities to support climate mitigation and adaptation in the touristic sector; iv) support the Alpine Climate Partnership, a new network of Alpine municipalities and the Alpine Pearls network, a collaboration of climate adaptation policy makers/consultative body.

A stock-taking exercise carried out in 2017 identified 100 climate change related activities by Parties to the Convention, many of the carried out in the context of the Alpine Space Programme, EUSALP, and Horizon 2020 research projects. (Balsiger 2018: 13).

This review of the two conventions reveals that increasing relevance is attributed to climate change adaptation. Ecosystem protection is also a key element in these conventions. However EbA and Eco-DRR are still not at the center of the agenda in neither of the two.

4.3 EbA in South America

The Tropical Andes are home to many diverse communities, from remote farming villages to large urban centres and capitals, such as Mérida, Bogotá, Quito, Cusco, El Alto and La Paz. In total about 60 million people live between 1,000 and 4,500 meters (Cuesta 2012). The Andes are among the world's biodiversity hotspots most vulnerable to climate change (Malcolm et al. 2006). These mountains contain a wide spectrum of microclimates harbouring unique diversity of ecosystems. Damage from climate change to these ecosystems can harm society (Schoolmester et al. 2016).

A recent UNEP mountain adaptation outlook for the tropical Andes (ibidem) already revealed that "adaptation policies tailored specifically to mountain ecosystems are extremely rare in the Andean region. This might be due to policymakers not perceiving mountains as isolated units for policy intervention and not treating them as a special type of ecosystems. Moreover policies address public problems and needs rather than specific ecosystems or territories, except perhaps in the case of Amazonian forest (e.g. Peruvian Forest Law)" (Schoolmeester et al. 2016:48). However, a similar trajectory may be initiated just for glaciers as Ecuador is doing by integrating weather stations' monitoring into the national network of weather

stations (ibidem). Another problem is the lack of strong institutions, stable budgets and political will as well as appropriate mechanisms to align international agreements to national agendas.

However, there are several local and country specific good practices and projects.

***Example:* Nor Yauyos Cochas Landscape reserve, Peru**

An example is the ecosystem-based adaptation pilot project in the Nor Yauyos Cochas Landscape reserve, in the Peruvian Andes. The project supported local communities in developing sustainable livestock practices, including grassland management to prevent overgrazing by domesticated animals. Examples of EbA measures implemented in the reserve include: management for animal fiber, community based sustainable native grasslands management including livestock management, and community based water management, including ancestral hydric infrastructure, wetland and grasslands restoration. As reported in Schoolmester et al. (2016), the project also made progress towards its aim to upscale EbA and to mainstream the concept in public policy. Through an initiative to foster the preparation of guidelines for public investments in biodiversity and ecosystem services, the project positioned EbA in the guidelines for public investment projects – jointly released by the Ministry of Environment and of Economy and Finance – related to biodiversity and ecosystem services.

***Example:* Drainage basin of the Uruguay river, Argentina and Uruguay**

Another example is the drainage basin of the Uruguay river, which, together with the Paraná river, forms the Río de la Plata estuary. This work has focused on the creation of a network of private nature reserves for the conservation of riparian vegetation and important grassland areas, protected area planning and management, biodiversity monitoring, and environmental education. The conservation of wetlands provided effective flood defenses, but also safeguarded the many other benefits that these ecosystems provide. In terms of reducing disaster risk, such restoration of freshwater wetlands offered protection to life and property from flooding and drought in the river Uruguay drainage basin. The authorities involved in the EbA project are the private nature reserve network – a conservation initiative – together with the Fundación Habitat & Desarrollo, the Argentina National Parks Administration, Masisa Argentina and Uruguay River Forestry Consortium (Fundación Habitat & Desarollo 2016).

***Example:* Agroforestry in Peru**

Between 2006 and 2007, an agroforestry project was implemented in the tropical rainforests of northern Peru (Sisa river basin) by Practical Action - Latin America. The project aimed to reduce the vulnerability of small-scale coffee and cocoa producers (farmers) and strengthen their capacity to adapt to climate change. The project integrated environmental conservation into local economic development priorities. It built on local, traditional knowledge and strengthened social organisation, which opened up access to international markets. Subsequently, the project resulted in increased household income levels (Torres & Frías 2012).

***Example:** Climate services in Peru*

Two projects (Climandes 1 and 2) aimed to develop climate services for decision-makers in Peru and to improve the training of meteorologists in the Andean region. User-tailored weather forecasts helped the rural population in managing the impacts of climate change. This cooperation between MeteoSwiss and the Peruvian weather service was financed by the Swiss Agency for Development and Cooperation (SDC) and coordinated by the World Meteorological Organization (WMO).[13]

***Example:** EbA program, Colombia*

The EbA program in Colombia is working together with the Mayor's office, the Botanical Gardens, local NGO's and communities in the implementation of pilot projects for the restoration of mangroves in particularly vulnerable areas of the coastal lake of Ciénaga de la Virgen. Even if the case is a marine one, it is interesting for its upscaling capacity, from local to national level. Indeed the activities just described are part of a broader initiative that aims at supporting the city´s climate change plan (Plan 4C) and the national framework for (ecosystem-based) adaptation of Colombia´s Climate Change Policy. The general framework for adaptation to climate change in Cartagena de Indias is the "Plan 4C. Cartagena: Competitive and Climate Change Compatible" (2014). It is a long-term vision and framework for planning and action to achieve climate compatible development by 2040. EbA is one of its five core strategies. The project directly supports the inter-institutional technical committee by facilitating dialogue among its diverse members, e.g. representatives from public administration, private sector, NGOs, education and research institutions. Tailor-made capacity development activities enhance a common understanding of EbA opportunities and limitations. By supporting the implementation of selected EbA measures as a joint learning process, the findings feed back into the strategic evolution of the Plan 4C as well as the national framework for (ecosystem-based) adaptation to climate change. The expected impacts of concrete EbA measures - such as the recovery of canals and channels - are supposed to show economic, social and environmental benefits in the short and medium term, thus contributing to a practical proof of concept.

4.3.1 Regional and subregional policy instruments

Regional and sub-regional level policy instruments (Schoolmeester et al. 2016) have been created so far in the framework of three main regional organizations in which the Andean countries participate:

1. **UNASUR**, the Union of South American Nations is formed of 12 countries (Argentina, Bolivia, Brazil, Colombia, Chile, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay and Venezuela). Its stated objective is to build a space for cultural, economic, social and political integration. In its key guiding documents, effects of climate change, disaster prevention and ecosystems are mentioned. Yet, there is not specific action led to EbA nor a commission to address climate risks.

[13] https://www.meteoswiss.admin.ch/home/research-and-cooperation/projects.subpage.html/en/data/projects/2016/climandes-2.html

2. **CAN**, the Andean Community of Nations was formed to promote industrial, agricultural, social and trade cooperation between member countries (Bolivia, Colombia, Ecuador, and Peru). Environment has been a top priority as stated in the Andean Environmental Agenda (AEA), which includes: the climate change adaptation program (including ecosystem and climate change impact information); project for adaptation to the impacts of receding glaciers – including a pilot project on glacial basins in Bolivia, Ecuador and Peru); Climate change and environment in the social and economic cohesion sector ANDESCLIMA; establishment of research stations and projects for monitoring climate change impacts on biodiversity (GLORIA Andes), including among its objectives the production of regional outlooks aimed at supporting the design of adaptation measures and policies under an ecosystem-based approach.
3. **CELAC**, the Community of Latin American and Caribbean states is an effort to deepen Latin American integration. CELAC hosted a meeting in 2014 for the elaboration of the sixth special declaration on climate change and disaster risk management. The declaration stressed the need to comply with the Kyoto protocol and the principle of common responsibility. It also called for developed countries to respect and strengthen their commitments to financing climate change adaptation.

The *Consorcio para el Desarrollo Sostenible de la Ecoregion Andina* (CONDESAN) is also playing a critical role. 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. 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 (Kohler et al. 2012).

4.4 In-depth case analysis

On the basis of the search described in Section 2.3 four in-depth cases were selected:

- **Tacaná Watersheds transboundary water governance through local community ecosystem-based action (Mexico-Guatemala), Central America**: this is a successful example of transboundary water resources management in mountain regions. It shows that community-level participation in transboundary water resources management adds value to conventional transboundary approaches. It also shows that planning and implementation of ecosystem-based adaptation can be successfully shared between communities across boundaries.

- **Sustainable mountain ecosystems management in the High Pamir and Pamir-Altai Mountains (Tajikistan-Kyrgyzstan), Central Asia:** this case is transboundary, in a mountain region and with an ecosystem-based approach component (though not as strong as in the other cases). Most notably a transboundary strategy and action plan have been implemented.
- **Nor Yauyos-Cochas Landscape Reserve (Peru), South America:** this case has been included because it is an exemplary EbA project in a mountain region. Examples of EbA measures implemented in the reserve include: management for animal fiber, community based sustainable native grasslands management including livestock management, and community based water management, including ancestral hydric infrastructure, wetland and grasslands restoration. The project also made considerable progress to upscale mainstream the EbA concept in public policy. Most notably, policy guidelines for public investments in biodiversity and ecosystem services have been prepared.
- **Isar river ecosystem-based restoration (Austria-Germany), Europe**: this case has been included for its innovative ecosystem-based approach to river restoration, described as "the best practice example for river restoration worldwide" (Martin et al. 2019). The Isar is a 270 km long transboundary river; the renaturalization process described below has been implemented on a 8 km stretch of the river, crossing the city of Munich in Germany. The positive side effects of this ecosystem-based river restoration project are relevant for the entire river and the countries that it crosses.

The case study analysis below follows the regional/transboundary governance opportunity structure described in Section 2.1.

4.4.1 The Tacaná Watersheds transboundary water governance through local community ecosystem-based action (Mexico-Guatemala), Central America

Territoriality

The watersheds of the Tacaná volcano, which stands at an altitude of 4,093 m, cover a transboundary area of 3,170 km2 right in the middle of the border area of the Department of San Marcos, Guatemala, and the State of Chiapas, Mexico. This area comprises the Coatán, Suchiate, Cosalapa and Cahoacán rivers. The Coatán and Suchiate watersheds originate on the volcano, with both shared by Guatemala and Mexico. Cahoacán and Cosalapa are subwatersheds of the Coatán River, within Mexico.

The watersheds of Tacaná are of great strategic importance for both Guatemala and Mexico since they supply water to the cities located downstream, irrigation water for agriculture and, in the lower reaches, fishing. The territory is mountainous in the upper catchments near the Tacaná volcano. Therefore upstream-downstream dynamics are central in this case. The devastation caused by Hurricane Stan in 2005 alerted the authorities and communities to the areas' vulnerability to climate change impacts and the need to increase resilience to tropical storms and flooding through improved infrastructure and restored ecosystems; the resulting

project also supported the rehabilitation and disaster preparedness plans in the storm's immediate aftermath.

The area is vulnerable both ecologically and politically. The climate is tropical humid and there is a high occurrence of hurricanes as well as volcanic activity. Deforestation and degradation of the upper watersheds and of river banks have led to erosion and flooding and reduced capacity of the watersheds to absorb water. The area is also exposed to a number of socio-political challenges such as a lack of technical support between institutions, the marginalization of indigenous people, high illiteracy and mortality rates, very high population growth, and complex land tenure rights.

Ecosystem-based adaptation

Through its Water and Nature Initiative (WANI), which ran from 2001-2013, IUCN and partners set up a demonstration project in the Tacaná watersheds that combined pilot livelihood projects (water, soil and environmental conservation) and bottom-up integrated governance and management of water resources (freshwater ecosystem management).

WANI's main goal was to "mainstream an ecosystem approach into catchment policies, planning and management." The activities were structured around the Initiative's strategic objectives, including: to demonstrate ecosystem management in river basins; to support wise governance of water resources and wetlands; to develop and apply economic tools and incentive measures; to empower people to participate in sustainable water management; to improve knowledge to support decision making; and to learn lessons to raise awareness on wise water use.

WANI and partners supported the design of numerous community pilot projects which addressed water, soil and environmental conservation. Examples include: i) forest nurseries for reforestation and promotion of agroforestry on farms; ii) facilitating development and networking of community enterprises and cooperatives working in, for example, beekeeping, fish farming, forest butterfly farm ecotourism; iii) community gardens, organic farming and soil conservation projects; iv) construction of septic systems to improve sanitation and raise water quality in the Suchiate River; v) protection of springs for domestic water supply and installation of piped distribution; vi) establishment of a demonstration and training centre in Chiapas for integrated management of watersheds.

Institutional formality

One of the key lessons learnt and put at the forefront of the initiative has been summarized as follows: "Projects developed by communities rather than external institutions address the real demands of communities, not just institutional goals" (Barchiesi and Córdoba 2016). The main beneficiaries have been local communities in the Department of San Marcos, Guatemala and the State of Chiapas, Mexico; fishers and farmers, students, local authorities, women (made up 90% of those implementing livelihood projects). The Tacaná project developed a water planning and community management model based on: i) broad community participation and recognition of Microwatersheds as planning units; ii) the involvement of local political authorities in environmental management; iii) building community capacity in IWRM, and iv) forging strategic collaborations with government and

nongovernmental organisations. With support from the Tacaná project, communities built micro-watershed councils to lead watershed restoration and development that met their priorities.

A key enabling factor was that the Councils were recognized by local governments from the start as town mayors participated in the organizational process. In Guatemala, microwatershed councils encompass 10 to 20 communities who share water resources in the watersheds of tributary streams. The Microwatershed councils join together and thereby expand their actions to include watershed management at different scales. The councils are organized to coordinate resource management and, critically, how this can be integrated with community development. The microwatershed model is inclusive, highly participatory and based on strategic collaborations. The microwatershed model was central to the achievement of the project's objective of building the adaptive capacity of the watershed and local livelihoods through empowerment of community-owned institutions.

A key role has also been played by a local NGO, *Jóvenes en la Misión* (Youth in Mission, JEM) which had 200 members actively involved within the municipality of San Marcos and a total of 2,000 youth working together on water issues in Guatemala. JEM began as a Catholic environmental education initiative run by a group of young volunteers promoting sustainable water use and watershed restoration. During the course of the project Jem became a medium size youth-run cooperative enterprise.

Sectoral integration

The main sectors involved have been water, risk and land use management. The adoption of an ecosystem-based approach facilitated sectoral integration. One of the key lessons learnt has been summarized as follows: "This restoration of ecosystem services in the upper watershed has achieved results for water supply, farm livelihoods and disaster resilience. Through taking an ecosystems approach to IWRM, which focuses on environmental restoration for livelihood security, these small scale initiatives have energized the communities to self-organize and has enhanced their development opportunities."

Vertical coordination

Alliances were developed and an ecosystem-based approach to water management was integrated from local to national and transnational level. The most notable cooperation initiatives are summarized below.

At the community level in Guatemala, WANI facilitated the development of collaborations with the Community Development Committees and coordinated with Municipal and National Development Councils to enable integration of microwatershed planning and management with community-led action on development. At the department level in San Marcos, in Guatemala, an alliance was created with 16 governments and NGOs to form the Inter-Institutional Coordination for Natural Resources and the Environment of San Marcos. CORNASAM has adopted the microwatershed as the unit of planning and, together, these groups have coordinated outreach and training in the microwatershed approach. As a result of the success of the microwatershed model at the local level, the National Microwatershed Commission of Guatemala was established, comprising several government ministries and

NGOs/IGOs (Action Against Hunger, FAO and IUCN) to lead the application of governance reform through microwatershed management countrywide. This National Commission will facilitate the preparation of national public water policies. In Mexico the new water law of 2003 outlined and supported the implementation of water councils.

At the transboundary level WANI and partners convened the first bi-national forum of mayors to jointly analyze and identify environmental problems in the two basins. This led to the signing of the "Tapachula Declaration of Intent" by Mexican and Guatemalan mayors, which supported cooperation on joint actions on watershed management and provided a platform for information sharing by governmental agencies at the very local level.

CSO participation

Civil society participation has been really broad in the WANI. With support from the Tacaná Project, communities built microwatershed councils to lead watershed restoration and development that met their priorities. Empowerment of community-owned institutions is making watersheds more secure and livelihoods less vulnerable to climate change. The project also facilitated the collection and organization of locally available information and knowledge and increased local awareness of basin dynamics and water management. Examples of activities include:

- A virtual platform for dialogue to strengthen projects along the borders of Guatemala and Mexico. This is the result of the declaration of intent mentioned above. As a result, actions are now being coordinated to protect forests through joint actions for the prevention and control of forest fires, as well as actions in protected areas.
- WANI facilitated grassroots mobilization in Mexico through the establishment of 'virtual water resource libraries' in the town halls of five municipalities. These provided access to up-to-date information and knowledge on water resources and the environment in the region.
- The inclusion of learning from pilot projects into the University of San Carlos's academic studies through 10-month internships. This programme contributed to the creation of a critical mass of professionals trained in WANI concepts, approaches and practices who will eventually go into professional positions in different institutions and organizations active in the area, creating an influential feedback loop.
- The private sector was included in payments for watershed services schemes in the middle part of the catchment, but only for smaller scale holders. In the lower part, large palm and banana tree growers from Guatemala use large amounts of water with no compensation for water retention services upstream. The PES scheme was implemented through the Living Water Partnership which is composed of six associations that seek to implement revenue mechanisms to feed an environmental fund dedicated solely to conservation work in the Tacaná watersheds. Through conservation projects in the middle and upper watersheds, it seeks to protect and restore the area's water resources. Through this Partnership, a payment for ecosystem services process was established in 2008 in the municipality of San Pablo, Guatemala called FOGESHIP (*Fondo de Gestión Hídrica Participativa*), to protect and

restore the area's natural resources, especially water resources. As well as a demonstration project named "Water for the Future" (*Agua para el Futuro*) in Tacaná town. Discussions have also been ongoing on the establishment of a water fund. In addition, a training course on payment for ecosystem services was developed during 2010 and is now available online.

Science-policy interface

Scientific knowledge played a critical role in this initiative. Most notably the microwatershed model was central to the achievement of building the adaptive capacity of the watershed and local livelihoods through empowerment of community-owned institutions. Academia also played a key role in setting up two drafts of the codes of conduct used to establish a set of shared principles or guidelines for the Tacaná watershed. Two Draft Codes of Conducts were prepared in 2008 for the Tacaná watersheds. A draft technical action plan for shared watersheds management was produced by technical staff from universities and other institutions from both countries, as an initial step, with support from WANI. A technical group with the participation of scientists and technical staff from each country was formed and several coordination meetings took place. Since 2008, WANI and partners have facilitated high-level training courses on transboundary watersheds in Guatemala and Mexico. Scientific institutions also contributed to the economic valuation of water resources, payments for ecosystem services, provision of locally available information and capacity building for learning and leadership. The project's Living Water Partnership established a PES scheme in Guatemala to protect and restore the Tacaná Watersheds' natural resources, focusing primarily on water.

Funding arrangements

A number of donors, public and private, supported the project: DGIS –WANI, IUCN, The Dutch Embassy in Guatemala, Fundación Gonzalo Río Arronte I.A.P., Japan Water Forum Fund, UNDP, AMANCO (for JEM), CARE, ACTION AGAINST HUNGER, Howard Buffet Foundation, through the Global Water Initiative (GWI), and *Sociedad de Historia Natural del Soconusco* (SHNS), an IUCN member.

The Mi Cuenca project, funded by Howard G. Buffet Foundation through the Global Water Initiative (GWI), aimed to reduce communities' vulnerability to water-related shocks through IWRM in El Salvador, Guatemala, Honduras and Nicaragua. Mi Cuenca (*Manejo Integrado de Cuencas en Centroamérica* "Mi Cuenca" (My Watershed) is being implemented in the Department of San Marcos by a consortium of IUCN, CARE, and CRS, with support from other organizations such as SIMBIOSIS, Fundación AVINA, Fundación Solar, Fundación del Bosque Tropical, Rain Forest Alliance, and the National Forest Plan.

4.4.2 Sustainable mountain ecosystems management in the High Pamir and Pamir-Alai Mountains (Tajikistan-Kyrgyzstan), Central Asia

Territoriality

This case is about EbA in the High Pamir and Pamir-Alai mountain ranges, which are mainly shared by Tajikistan and Kyrgyzstan. The mountains' northern chains form the border between the two countries. The Pamir Mountains cover about 50 per cent (some 70,000 sq km) of the territory of Tajikistan. The Pamir-Alai range constitutes the southernmost part of Kyrgyzstan, which is similarly highly vulnerable to land degradation and natural disasters, such as landslides and mud flows, with calamitous consequences for the densely populated southern stretches of the country as well as the Tajik Pamirs. In recognition of the need for protecting the unique and fragile environment in the High Pamirs and Pamir-Alai region formed by the extreme bio-physical conditions, high altitudes (3,000 to 7,400 meters), and the special arid to sub-humid climatic regime, both Tajikistan and Kyrgyzstan have undertaken the protection of certain parts of the mountain ranges within the framework of national protected area management schemes.

Ecosystem-based adaptation

The Pamir area is renowned for its unique mountain ecosystems with many endemic plants and animals, and thus constitutes an important global gene pool with outstanding importance for the whole of Central Asia. Current land and water resource management practices, however, are seriously threatening the long-term preservation of this unique mountain area as a space both for human use and wilderness. The following governance barriers to EbA have been identified: lack of sufficient and adequate regional institutional, political, regulatory and financial mechanism for sustainable environmental management; lack of harmonized and unified data, as well as an efficient mechanism for data management and exchange; insufficient public participation at all political levels in environmental management, and insufficient capacity for project development, implementation and resource mobilization.

Institutional formality

The project developed a transboundary strategy and action plan (PATSAP) aimed at developing institutional capacities, human resources and effective mechanisms for sustainable land management through integrated, participatory resource management approaches. More precisely, the aim of PATSAP was to mitigate the causes and negative impacts of land degradation on the structure and functional integrity of the ecosystems of the High Pamir and Pamir-Alai Mountains through mainstreaming sustainable land management tools and practices from households, community, local government, national and regional levels. The strategy includes four action plans, specifying targeted EbA measures for sustainable use and management of the region's croplands, pastures, forest and biodiversity, and for ensuring human security developed, endorsed and integrated in regional, national and local development plans, providing a basis for mobilizing increased support for and targeted investments.

At the regional and national level the PATSAP has been accepted by the State Agency on Environmental Protection and Forestry (Kyrgyzstan) and the Committee on Environmental Protection (Tajikistan) and establishes a Trans-boundary Coordination Council with membership of the two key national agencies, the Kyrgyz NCMRD and the three constituent administrative regions of the Pamir-Alai mountains (Gorno-Badakschan Autonomous Oblast and Jirgital Region in Tajikistan and Osh Oblast in Kyrgyzstan) who have signed a transboundary memorandum of cooperation on the implementation of the PATSAP. Moreover there has been clearly commitment to reform of the legal framework with the enactment of the Law on Soil Fertility (Kyrgyzstan) and the Mountain territories Law (Tajikistan) as well as the ongoing process of establishing the progressive Law on Pastures in each country.

Sectoral integration

The key sectors involved have been land use planning, forestry, nature and agriculture.

Vertical coordination

PATSAP provides a decentralized implementation mechanism, considered as most suitable and effective by the participating stakeholders, which was defined in the strategy. Targeted steps towards its operationalization were undertaken resulting in a wide range of multi-level follow-up activities, initiated by individual stakeholders and/or supported by the UNEP project. This provided a basis for the internalization of costs, the allocation of additional state resources and the removal of political barriers to SLM in the trans-boundary region in-line with the goals and priorities identified in the regional SLM strategy.

A decentralized implementation strategy was considered the most suitable and effective by participating stakeholders. However the project evaluation highlights the presence of barriers at national level and the lack of national level funding mechanisms for transboundary initiatives.

CSO participation

It has been a tool for identifying key needs, options, and priorities in the trans-boundary region and for mobilizing multi-level stakeholder commitment to follow-up on them.

Moreover the project engaged with local stakeholders all along and provided expert and community-based evaluations of changes in the state of land resources, which were conducted separately through annual impact reporting, the end-of project household survey and the focus group discussions.

Science-policy interface

The role of scientific actors had not been particularly relevant in this case or at least it is not mentioned in the sources analysed.

Funding arrangements

Funding was streamed through the development of micro-projects to address ecosystem degradation and rural poverty by implementing innovative field level sustainable land

management practices. An ex-post project evaluation reveals that only 7 out of 165 micro-projects (2 in Tajikistan and 5 in Kyrgyzstan) proved successful, having failed to generate their expected benefits and have led to tangible improvements in the livelihoods of the majority of the beneficiaries. At the local level, most of the micro projects were expected to be financially self-sustainable. The final impact assessments found a readiness to re-invest in maintaining them.

4.4.3 Upscaling EbA in Peru

Territoriality

This case study is about the implementation of EbA measures in the Nor Yauyos-Cochas Landscape Reserve, Peru. The vulnerability assessment was completed, the specific areas and the measures to be implemented were identified, including the communal management of native grasslands, vicuñas management (a wild relative of the llama), the expansion and conservation of wetlands and the restoration of water infrastructure.

Ecosystem-based adaptation

The following EbA measures have been implemented: community-based grassland management and domestic livestock husbandry associated with management of *vicuñas* in the wilderness and restoration of ancestral water infrastructure. In order to start with the implementation of measures, not only the results of the vulnerability and risk assessment were required, but also joint work between the project and the head of the landscape reserve in order to ensure that the measures were articulated and reinforcing the master plan. The prioritization of the EbA measures was carried out jointly with the local communities, who chose the measures according to their interest. The project has led to improved management of water from the upper watershed, reducing its scarcity and improving the quality of the pastures. Wetlands were recovered, reducing vulnerability to climate change.

Institutional formality

This process was supported by the communal and some district authorities. In addition, trainings were developed for interest groups and park rangers of the landscape reserve, all of this to ensure the implementation, appropriation and sustainability of the activities. Finally, it was important to develop local management plans for each community. These management plans are part of the commitment of each community to continue with the EbA measures. These management plans go hand in hand with the landscape reserve´s master plan.

Vertical coordination

One of the most notable results of the Mountain EbA project is Peru is the upscaling, i.e. the collaboration with the Ministry of Economy and Finance and the ministry of the Environment and Natural Resources on development of **policy guidelines for public investment in biodiversity and ecosystems**. The guidelines made the case for increasing EbA public investment. Based on the forerunning cases (like the Nor Yauyos Cochas Landscape reserve), the guidelines provide a framework for formulating and implementing public investment projects at local, regional and national level.

Sectoral integration

The guidelines promote sectoral integration, e.g. by opening a path for investing public finance in projects such as watershed management and species conservation.

CSO participation

The local population actively collected information on climate change and adaptation processes and organized into interest groups, research groups and specific committees linked to EbA. Many community members decided to devote time and effort to make these groups work and to implement the activities proposed by the project. The participation of the different actors has been strengthened during the life of the project, contributing to its sustainability.

Science-policy interface

Scientific vulnerability assessment has been coupled with participatory processes. It was considered particularly important to understand the vulnerability to climate change of ecosystems and of populations living in the reserve and whose livelihoods depend directly on the reserve´s ecosystem services. The objective was to determine the level of sensitivity and the ability to cope with the adverse effects of climate change and extreme events using present observations and future scenarios. Based on the results of these vulnerability and impact studies, the districts with higher vulnerability of ecosystems and ecosystem services - if current management practices would be continued – were identified. This information served not only to select pilot areas but also to confirm that previously identified EbA measures were adequate to increase resilience of ecosystems to climate change. In parallel, the study was accompanied by a complete and agile and participatory process that generated other quantitative and qualitative information to effectively implement EbA.

Funding arrangements

This pilot project was part of the ecosystem-based adaptation programme, a global initiative implemented by UNEP, UNDP and IUCN, funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. The World Conservation Monitoring Centre (UNEP-WCMC) also participated in this effort. These organizations cooperated with national governments to use the EbA approach. Similar experiences of EbA in mountains were being developed in the Himalayas in Nepal, and in the East African mountains on Mount Elgon in Uganda. In Peru, the programme was commissioned by the Ministry of Environment of Peru (MINAM) with the support of the National Service of Natural Protected Areas (SERNANP).

4.4.4 Isar river ecosystem-based restoration (Austria-Germany), Europe

Territoriality

The Isar is a transboundary river that originates in the Northern Austrian Limestone Alps and joins the Danube in Bavaria, Germany, after flowing through Munich. The Isar catchment area is around 9,000 km2 large and the river is 270 km long. Due to its large and varying

discharge, the Isar is subject to frequent floods. The Isar is commonly named "the wild river" because of its extreme floods and related massive sediment transport. Nowadays, the Isar river is considered as one of the last wild river in Germany, but it conserved its natural character only in small river sections. This case focuses on the river restoration approach adopted for flood control, biodiversity and recreation purposes in the city of Munich, Germany. As an ecological corridor for numerous alpine fauna and flora species, the Isar and its riparian zone are home to many protected areas, such as over 100 km of Nature 2000 sites.

Ecosystem-based adaptation

Isar river management in Munich started in the 18th century with the urban expansion of Munich and entailed major alterations to 'tame' the Isar by straightening and channelizing it. In addition, weirs and dams were constructed once the hydropower industry expanded with the most important morphological modifications occurring in the 20th century. In the 1990s the local authorities realized that parts of the Isar no longer complied with European flood protection standards (Wasserwirtschaftsamt München and Landeshauptstadt München 2011). Although Munich has thus far been safe from floods, hydrological models run by Munich's State Office of Water Management (Wasserwirtschaftsamt München) showed that the city of Munich was at risk from a 100-year flood event, despite the construction of the Sylvenstein Reservoir South of Munich in 1959. Arguably, the Isar-Plan in Munich therefore only reduced the residual risk of floods.

Beside flood risk reduction several other issues catalyzed the restoration of the Isar: decrease in ecological functions and available habitats; loss of balance in the morphological processes (e.g. deposits are stopped by weirs and river gets deeper); impossibility of fish migration; decrease in water quality and quantity; lack of access to waterline for users. As a result, the Isar-Plan/"New life for Isar" project was first initiated in 1995 and implemented in 2000-2011 (Wasserwirtschaftsamt München and Landeshauptstadt München, 2011). The focus of the Isar-Plan was an 8-km stretch of the Isar to the South of Munich City, starting at the Grosshesseloher Bridge up to the Cornelius Bridge in the center of Munich. Other minor projects run in parallel included the creation of a fish pass or the ongoing negotiation with energy producers to release more water into the river bed. The key principles of EbA river restoration have been: i) copy nature and use nature-oriented construction methods; ii) improve the ecological and retention potential for the river system and flood plain; and iii) restore the natural conditions as much as possible (hydro-morphological processes).

Institutional formality

A number of key stakeholders were involved in the Isar-Plan. The project was headed by Munich's State Office of Water Management. To assist the water authority in their task an interdisciplinary working group including members of the city council, Department of Public Construction, Department of Urban Planning and Building Regulation (*Referat für Stadtplanung und Bauordunung*) and the Department of Health and Environment (*Referat für Gesundheit und Umwelt)* was set up in 1995. After 2000, the city's Department of Public Construction (*Baureferat*) was assigned responsibility for the project. On top of these core

members, guest representatives such as NGO members or experts were regularly invited to roundtable discussions of this working group to integrate various views and disciplines into the project planning. Citizens were represented by Munich's different district councils (*Bezirksausschüsse*), which helped consolidate the vision of a restored Isar.

Sectoral integration

Key sectors involved have been water, risk management, urban development and land use planning, energy, climate and environment protection. The creation of working groups (such as the Isar-Plan working group, see next section) facilitated sectoral integration. The public sector played a critical role in the implementation of the Isar plan. NGOs and civic initiatives (see also section on civil society participation) have also been a key catalyst, even if they did not directly fund the project. The private sector did not play a critical role.

Vertical integration

The State of Bavaria and the City of Munich have been the two key player in the funding and implementation of the Isar plan. Vertical coordination between these two levels has been strong. The Munich Water Agency represents the State of Bavaria in Munich. To facilitate the Project's smooth progress, the Water Agency created the Isar-Plan working group, consisting of permanent representatives from various institutions (including various departments of the City of Munich) and guests that were brought in from different areas of expertise (such as ecologists, hydrologists and engineers). This working group served as an important information exchange platform for the Project and allowed (selected) stakeholders to discuss potential areas of conflict before they arise. Partially instigated by staff turnover, this was the first time such a group was created for this kind of Project, which certainly contributed to the governance innovation of the Isar-Plan.

CSO participation

The Isar river ecosystem-based restoration has been defined as a participatory living lab because of the high degree of citizen engagement. This dated back in the late eighties when the citizen views about river management were gathered by the Münchner Forum, a local citizen association, which consulted 10,000 residents about their visions for the Isar. The results have been taken into account in the local decision making process and specifically for the Isar Plan project. For example the results showed that the Flaucher area in Munich combined many of the traits that citizens associated with a more pristine riverine habitat. This location thus played a crucial role as a model for the Isar 'renaturation'. In addition two other citizen initiatives played a central role in shaping the Isar-Plan: the Münchner Forum (involving citizens in city matters by working closely with the Bezirksausschüsse) and the Isar Allianz. The Allianz was created in the early 1990s, in relation to an event that catapulted the river restoration onto the political agenda: the ending concession for the Mühltal hydropower plant South of Munich, to which most of the Isar's water was being diverted. This concession renewal was used as an opportunity by environmental groups, rallied under the Initiative Mühltal, to demand a higher discharge of the Isar, synonymous to higher ecological quality. Their voices were heard, and the Isar's residual water was increased from 5 to 12 m^3/s.

Members of the Initiative Mühltal became the Isar Allianz in 1993, and therefore lay the foundations for the Isar-Plan by gathering major environmental NGOs in and around Munich.

Notably, there has been also citizen opposition to the Isar plan. The main challenge in the implementation of the project was an initial opposition to change of some citizens (despite the above-mentioned calls for a more environmentally sound solution), who wanted to keep the river as they knew it. Additionally, residents living close to the river were concerned about the project's construction noise.

Science-policy interface

Guest representatives such as NGO members or scientific experts have been regularly invited to roundtable discussions of the Isar-plan to integrate various views and disciplines into the project planning. Multidisciplinary expertise was brought in from three main groups: i) the different departments of the City of Munich (e.g. experts in ecology, horticulture, hydrology) which were gathered in the Water Agency's working group; ii) hydrological models run by the Water Agency and academia; iii) real-life downscaled models of the Isar, conducted by Munich's Technical University (TUM) and the Bundeswehr University Munich.

Funding arrangements

The project was jointly funded by the State of Bavaria and the City of Munich, covering 55% and 45% respectively of the total cost of €35 million (consisting of €28 million for building costs and €7 million for the disposal of dangerous waste from World War II). The European Commission contributed an additional €4 million to the Project. The aims of the Isar-Plan project were threefold: flood protection, enhancing the river's ecological status through restoration, and improving its recreational use. To this end, a combination of nature based solutions and hybrid measures were implemented along the Isar in Munich. Examples of the implemented measures include: i) the widening the riverbed from 50 m up to 90 m; ii) the removal of concrete steps in the river, which were obstructing the upstream movement of aquatic species; iii) the restructuring of riverbanks which were flattened with gravel; iv) the enhancement of existing dykes with concrete inserts, allowing trees on the riverbanks to remain intact; v) the addition of boulders, for example to create a 'fish ladder' creating stepping stones and corridors for fish and resting places for juvenile fish; and vi) the addition of driftwood to create biodiversity refugia.

4.5 Regional governance opportunity structure

Grounding on the literature review and the case database, this section describes some key issues related to the features of the regional governance opportunity structure.

4.5.1 Territoriality

Mismatches between geographical and administrative units

Ecosystems often cross geographical and administrative borders. This is one of the reasons why it takes time to adopt a truly EbA focused approach. Lessons can be learnt from the implementation of river basin approaches and management plans. In Europe, for instance,

some thirty five river basin districts defined under the Water Framework Directive cross an international boundary; fifteen transboundary parks have been certified by Europarc (the network of European protected areas) and a host of economic, sociocultural and environmental issues have been addressed in more than seventy cross-border Eu(ro)regions (Balsiger 2015). In the case of the river basin districts a problem is related to the mismatches between geographical (river or, in our case ecosystem-based) and administrative units. This can undermining the effectiveness of proposed interventions or slow it down (Scolobig et al. 2015). ecosystem-based macro and/or eco regions -such as in the case of the Yellowstone to Yukon Initiative- can be an option to address the mismatches mentioned above.

***Example:* Yellowstone to Yukon Initiative, US-Canada border**

The Yellowstone to Yukon region spans across the US-Canada border, its southern end rooted in the Greater Yellowstone Ecosystem in the United States wholes its northern most point lies in Canada´ Yukon territory. The region is largely characterized by mountainous terrain principally, though not exclusively the north to south trending Rocky Mountains (Chester 2015).

As pointed out in Balsiger 2018, of all the MRG initiatives, "the Y2Y most closely follows an ecosystems boundary; the Y2Y website describes it as "one of the last intact mountain ecosystems left on Earth." Yet that boundary was not always stable, as it expanded significantly during the early years with the growing number of Y2Y participants. Furthermore, while the 1998 Y2 Atlas used the term ''ecoregion'' in its subtitle, it referred to the ecoregion as "something of an artificial construct" and suggested that the boundary on the maps should not be interpreted as a sharp delineation based on a crisp ecological difference, but rather as a permeable membrane, through which animals, rivers, and ecological processes cross continually" (Balsiger 2018:7).

4.5.2 Institutional formality

Transboundary governance models, institutional structures, and policy instruments support and mainstream effectively ecological restoration activities into the particular public planning and private decision structures at the local level.

Upscaling

Ecosystems, and how they buffer against certain hazards are locally specific, which makes it difficult to replicate and upscale the same measures in other locations and achieve the same results. Because of the important variability of environmental and geomorphic features, what works in one place, may not work few kilometers away (Chatenoux and Peduzzi 2007). These physical limits to replication have indirectly hindered also the institutionalization of EbA.

Lack of standardized technical guidelines

Another main constraint to scaling up Eco DRR/CCA and nature based solutions (NBS) is the lack of standardized, technical guidelines for designing and using ecosystem-based measures for disaster and climate risk reduction. The lack of even seemingly minor institutional arrangements, like standards and certifications for the construction and

performance of EbA or NBS that respect ecosystem services, can pose almost intractable barriers (La Fortezza et al. 2018). To overcome them there is a need to improve quantification of the costs and benefits of ecosystem/NBS investments and monitoring of the success (or otherwise) of management actions to protect and restore ecosystems.

Notably, in February 2019, the IUCN (International Union for Conservation of Nature) has released a proposal for a standardized approach for design and verification of NBS interventions for public consultation. At present the proposal is under review of different organisations and bodies (e.g. EC NBS funded projects are expected to provide feedback).

Towards NBS standards

The draft of the standardized approach for design and verification of NBS intervention proposed by IUCN is composed of seven criteria which are broken down into several indicators each. These are accompanied by guidance and examples to explain the intent of the indicators. The criteria are: 1. NBS conserve, restore and sustainably use ecosystems to address societal needs; 2. NBS are transparent and stakeholder inclusive throughout their lifecycle; 3. NBS are governed and managed adaptively; 4. NBS produce societal benefits while seeking to balance trade-offs; 5. NBS are planned and implemented at landscape/seascape scale; 6. NBS seek synergies with other type of interventions where necessary to meet societal needs; 7. NBS are integrated into policies and regulatory frameworks

More information on https://www.iucn.org/news/ecosystem-management/201901/informing-global-standard-nature-based-solutions]

Several ongoing projects aim at developing e.g. frameworks for assessing the effectiveness of ecosystem-based approaches to adaptation (e.g. Reid et al. 2018)

***Example:* Mahanadi Delta region, India**

A cluster planning approach has been proposed for the disaster risk reduction planning in the Mahanadi Delta region. The approach comprises small landscape units of communities facing similar risks, in order to bridge administrative and ecological boundaries for reaching effective risk reduction outcomes. In this delta region, which is exposed to multiple hazards, three clusters have been identified: each one includes distinct ecosystems based options for risk reduction. In each cluster administrative planning has been embedded with ecological planning thus enabling a more realistic integration of ecosystem services in the context of disaster risk reduction (Kumar et al. 2016).

4.5.3 Sectoral integration

EbA is cross sectoral in nature (Reid et al. 2019) which requires collaboration in planning and management at local, provincial and national levels. Most governmental planning, however, is highly sectorial. Antagonisms between different sectors may have negative and unexpected side effects. For example Reid et al. (2018) report that housing climate changed within the Department of Environmental Affairs in South Africa inhibited EbA

implementation at times because the issue was seen as an additional responsibility that stakeholders from other departments had to undertake without extra funding or support.

Barriers exist that hinder sectoral integration- particularly across borders- such as language, differing political priorities, divergent funding mechanisms, competition for resources and mismatched timescales for implementation.

There is less experience for cooperatively developing lateral multisectoral strategies (Braunschweiger et al., 2018) amongst administrative members, and traditional conflicts may hinder fruitful cooperation. Coordinating agencies which take on organisational duties for other sectors without challenging their sovereignty are viewed as successful options for increasing horizontal cooperation (ibidem) along with building on existing networks already in place. Task-oriented project collaboration works best for issue-based cooperation between sectors, which requires to produce visible results. This can lead to longer term partnerships which integrate adaptation measures into ongoing development processes (Braunschweiger et al., 2018).

Fostering private sector engagement

New types of implementation arrangements in EbA/Eco-DRR/CCA increasingly involve the private sector, which has the potential of providing additional financing or co-financing (see section x), stimulate innovation and create business opportunities. Remarkable examples of efforts to engage the private sector include:

1. New natural infrastructure for business platform (NI4Biz) launched at the UNFCCC CoP21 in Paris by the World Business Council for Sustainable development which has approximately 200 members from private companies: the initiative encourage private sector investments in natural infrastructures and ecosystem-based solutions
2. Private sector alliance for disaster resilient societies (ARISE), a voluntary group of more than 100 large companies and SMEs convened by the UNISDR (United Nation office for disaster risk reduction). It has a potential scope to promote EbA, even if not addressed explicitly for now
3. Insurance sector, e.g. partnership between nature conservancy and Swiss Re to demonstrate cost effectiveness of ecosystem-based solutions in adaptation and risk reduction

Example: EbA and eco-tourism in Japan, Asia

In Japan, the Fukushima disaster opened a window of opportunity for policy reform and innovation. After it, the Ministry of Environment of Japan decided to upscale a national park along the coastline affected by the tsunami and use the park as a symbol for reconstruction by promoting eco-tourism and contributing to the local economy while preserving natural ecosystems as a buffer zone for natural hazards. The National resilience act and its basic plan and action programme also recognized the role of ecosystems, promoting land use using ecosystem functions of DRR (Cabinet Secretariat, Government of Japan 2016; Monty et al. 2016). The same is true for the new National Spatial Development Plan, the 4th National Infrastructure Development Plan in September 2015. The Japan International Cooperation

Agency (JICA) also started to integrate Eco-DRR into their mid-term programme for overseas development aid (Monty et al. 2016).

Mainstreaming EbA in the environmental sector

Two areas seem particularly promising to mainstream Eco/DRR/CCA, namely: management of protected areas (in order to incorporate climate change and disaster risk reduction considerations) and environmental impact assessment and strategic environmental assessment (Estrella et al. 2016).

4.5.4 Vertical integration

There is a strong momentum at the global policy level for EbA and, more in general, to link ecosystem management , DRR and CCA. At the same time there is a proliferation of Eco-DRR/CCA/NBS/EbA practices being implemented through community based and field level projects. The biggest challenge is translating global policy commitments into national, transnational and local level policies and legal frameworks and developing guidelines, technical standards, baseline approaches, institutional mechanisms and processes that encourage implementation. EbA and Eco-DRR/CCA are neither standard policies nor institutional practices at present: mainstreaming them is essential to facilitate replication and up-scaling of such approaches over time and over larger geographical areas.

Example: European cooperation for risk management in transboundary regions

In transboundary regions, the European Commission issues overarching strategies which provide common goals that filter down and adapt to reflect the character of its member states. This complements examples of European grass roots initiatives, which counter-act by generating vertical transfer of practical knowledge and best practice. Whilst top-down channels work in theory, both within nations, and between the European Commission and its member states, in practice it is sometimes a different story in trans-boundary regions (Abad et al. 2018). Strategic policies often fail to fit the local level, or overlook issues that require a more detailed and often unique perspective at the local and regional scale. Local trans-boundary issues are often inadequately communicated or considered at national level. There are gaps at local and trans-boundary level in terms of scientific investment, and in overcoming bureaucratic hurdles in order to share data and expertise. There is valuable work ongoing in the trans-boundary municipalities (e.g. Basel Stadt) and a proactivity in connecting with trans-border counterparts that must be supported “up the chain” in order to be sustainable. Federal offices, whilst having a broad view of trans-boundary issues, often do not grasp in sufficient detail the priorities of the (competing) sectoral requirements (e.g. Brethaut et al., 2015, Abad et al. 2018).

4.5.5 CSO participation

Trade-offs of implementing EbA

There are possible trade-offs in applying EbA measures, whereby stakeholder benefits derived from ecosystems do not necessarily yield “win-win” results for all. For instance,

Emerton et al. (2016) illustrate the case in Sri Lanka where converting mangroves into aquaculture and agriculture makes more financial sense in the short term to local landowners rather than sustainably using and managing mangroves, given that shrimp farming, coconut farming and salt production generate higher case returns and immediate sources of income, even if these activities are proved unsustainable over the long term or result in significant negative impacts on other groups or sectors. The same is true for the adoption of nature based solutions (NBS) which can not represent a "win-win" option e.g. for farmers because these measures usually occupy more land than grey measures.

Unintended consequences of EbA

As pointed out by Estrella and colleagues (2016), there is a need to better understand whether or not communities are actually interested in EbA solutions and not pressure that this is the best option available. Beside the need to develop standards and guidelines, there is also a need to better understand the potential unintended consequences of EbA projects. It is recognized that adaptation measures may have unintended consequences on e.g. longer term sustainability.

Example: The International Commissions for the Protection of the Rhine and Danube rivers, Europe

Two examples of River Basin platforms which engage multi-level stakeholders through concerted multi-lateral action are the International Commission for the Protection of the Rhein (ICPR 2005) and the International Commission for the Protection of the Danube River (ICPDR). The ICPR Action Plan against Floods is part of the Rhine 2020 initiative (Rhein 2020). It constitutes a series of basin management actions with a budget of 12 billion Euros, aiming to reduce potential damages by 25% and reduce extreme flood levels under a changing climate. The program also seeks to increase awareness using maps of flood-prone zones, such as the Rhine Atlas 2015, and increase capacity to raise alert by establishing collaborations between upstream and downstream observatories (Abad et al. 2018).

In his review of the evolution of Rhine river governance, Schiff (2017) credits the creation of spontaneous regimes in addressing *any* common purpose, as the best way to establish a shared history of governance among riparian actors themselves. Collaboration requires that actors identify their common issues and work to build organisations addressing those interests in a non-binding and informal way. The author argues that a trans-boundary network that can incorporate voluntary and proactive elements essentially, is far more likely to succeed long-term, and be able to adapt as policies change (Schiff 2017). This is in parallel with a move towards the need to agree on tasks, not on strategies - ideally informal cooperation, dealing with tasks, based on local knowledge (as agreement on strategies is often more difficult, or slower to achieve).

4.5.6 Science-policy interface

A successful institutional option in the case of many existing conventions and treaties is the co-existence of regional cooperation projects/programmes (such as INTERREG), with international scientific committees, regional observatories. Transnational working groups

(e.g. on adaptation) seem also to be a success factor together with macroregional strategies for policy alignment.

***Example:* Danube Floodplain INTERREG project, Europe**

The INTERREG project Danube Floodplain (INTERREG 06.2018-11.2020) aims at improving transnational water management and flood risk prevention while maximizing the benefits for biodiversity conservation along the Danube river. Danube is the second longest European river (2850 km), flowing through 19 countries and affecting the lives of 81 million people.

The Danube Basin was one of the first major transboundary river basins worldwide to adopt a CCA strategy when it did so in 2012, recently updated in 2018 (ICPDR, 2018). Along with other European rivers, the Danube faces changing flow patterns, brought about by intensifying storms, accelerated glacial melting upstream, and shifts in precipitation from snow to rain in upland catchments due to climate change.

The Danube has lost 80% of its wetlands and floodplains since the end of the 19th century and this calls for an integrated and ecosystem-based approach for river basin management.

Other reasons for adopting an ecosystem-based approach include that the Danube floodplains provide excellent habitats (5000 animal species and 2000 plant species), ecosystem services (biodiversity conservation, water purification, flood prevention, healthy fisheries and tourism) and play an important role in controlling floods by storing and dissipating the energy of high water discharges.

In this project ecosystem services assessment and cost-benefit analyses will be applied in five pilot areas in order to analyze the overall effect on flood protection and on other ecosystem services, e.g. biodiversity. The project is also studying trans regional effects of restoration measures. The project is expected to improve water management by better integrating benefits for the ecosystems, society, economy and flood protection throughout the Danube basin. Danube floodplain brings together experts from 10 countries and 22 organisations. Key target groups are ministries, river basin authorities and other practitioners.

***Example:* The Himalayan Monitoring and Assessment Programme HIMAP, Asia**

As pointed out in Balsiger 2018, a "focus on the need for scientific data, informed policymaking and effective adaptation to climate change" is a "crucial component of ICIMOD's work." In this respect, ICIMOD has implemented a number of programs, including AdaptHimal (implemented in Bangladesh, India, Myanmar, and Nepal with different IFAD investment/loan projects and technical agencies); HICAP (partnership with CICERO and GRID-Arendal initiated in 2011 to address critical knowledge gaps on water, climate and hydrology in five major Himalayan river systems); and Himalica (EU-funded project from 2012-2018 to support rural livelihoods and climate change adaptation). At present, the major initiative is the Himalayan Monitoring and Assessment Programme HIMAP (inspired by the success of the Arctic Monitoring and Assessment Programme AMAP), a comprehensive climate change impact assessment for the entire Himalayan region.

4.5.7 Funding arrangements

Interest is growing in investing in EbA/Eco-DRR CCA/NBS and green solutions; yet, especially business models - the process by which EbA value can be created, delivered and privately captured (Toxopeus & Friedemann, 2017) – are only emerging.

In general there is limited economic evidence to demonstrate why investing in ecosystems offers a cost-effective means of reducing disaster risk and adapting to climate change (Estrella et al. 2016). Moreover evidence is also scattered on their capacity to reduce risks- as opposed to classical "grey" measures (Rao et al. 2013). As a consequence, there is generally a persistent pattern of underinvestment in maintaining or enhancing ecosystems and ecosystem services for DRR and CCA (Shreve & Kelman 2014).

Limited evidence on EbA effectiveness

The potential of EbA is far from fully realized, arguably due to lack of evidence on the cost-effectiveness of nature/ecosystem-based solutions and to the lack of the fitting institutional arrangements and business models (Kremer et al. 2016). One of the main challenges in economic evaluation is the quantification of the risk reduction services (i.e. protection and regulatory services) provided by ecosystems. Other challenges include the definition of analytical boundaries (i.e. geographic scale and time horizon), setting parameters for the economic analysis (e.g. longevity of benefits and discount rates) and data collection to establish baseline conditions (Estrella et al. 2016).

While ecosystem valuation methodologies have been evolving in the last 20 years, their application in the contest of CCA and DRR remains nascent (Nehren et al. 2014; Emerton et al. 2016). Moreover the results of these applications are not always in favor of green measures (e.g. planting mangroves and replanting stream buffers)/NBS as opposed to grey measures (e.g. building seawalls and increasing drainage). For example Rao and colleagues (2013) show that, in terms of avoided flood damage, engineered measures provided 15-25% greater protection than ecosystem-based measures. The authors recommend a combination of both green and grey infrastructures for their case study (the city of Lami, in the Fiji). Also other authors (e.g. Emerton et al. 2016) suggest to abandon the idea of comparing and opposing "green and grey" approaches and to rather consider them as part of the same infrastructure to deliver adaptation and disaster risk reduction services.

An IIED (International Institute for Environment and Development) report published in 2019 (Reid et al. 2019) provides evidence on EbA effectiveness at 13 case studies in 12 countries assessing, among others, financial and economic viability. The results reveal that stakeholders perceived 11 of the 13 projects as delivering cost-effective EbA measures. Again 11 were perceived as more cost-effective than alternative. EbA projects tended to fare worse against alternative options when they required high initial investments (for example in heavily degraded areas), were evaluated using high discount rates which penalize benefits that accrue in the long term and when many of the co-benefits were non-monetary, thus not accounted for in the assessments.

Emerging EbA financing models

Innovative EbA funding models build on future investment projects, sustainable public funding and procurement strategies, entrepreneurial finance such as crowdfunding, microfinance through local and rural banks, or local sectoral associations, and other innovative financing arrangements, e.g. climate funds and blended finance (La Fortezza et al. 2018). There is a need to discuss financing options in depth, together with the institutional frameworks to support them. The following options can be identified:

- **Payment for ecosystem services (PES):** even if PES have commonly been used for financing conservation and carbon storage, they can be also used to capture DRR and CCA benefits. Example is Feiess at al. 2016. However some challenges could make PES for DRR unfeasible in some contexts. Challenges include: quantification of ecosystem services that contribute to DRR, managing the financial risk associated with natural hazards, distinguishing between service providers and users, need for multilevel governance (Estrella et al. 2016; Reed et al. 2014).
- **Co-financing**: Toxopeus and Friedemann (2017) argue that creating a diverse group of partners and financiers, from state money to foundation grants and local bonds, is a key enabler for successful regeneration of ecosystems also in mountain regions, where land banks can carry the initial risk (Schilling & Logan, 2008). Moreover there is a need to identify novel transboundary projects financing instruments. Of special interest are public arrangements (e.g., China's recent holistic tourism destination development program), and public-private-people partnerships (Martin et al. 2019). The balance between public and private models, however, is controversial (Sekulova & Anguelovski (*Naturvation*, 2017). In the US national government funds can already provide initial seed funding to kick start these initiatives that are also co-financed by local governments and communities (Whelchel & Beck 2016)
- **Other market instruments** e.g., fiscal incentives, subsidies, carbon markets (e.g. trading of carbon emissions which are derived from coastal blue carbon ecosystems such as seagrasses, salt marshes and mangroves. Carbon stored in ecosystems can be sold as credits which buyers use to offset their carbon emissions, thus creating mechanisms for funding and investing in ecosystem conservation projects, in Wylie et al. 2016), and benefit and cost sharing schemes

Example: Global ecosystem-based Adaptation in mountain ecosystems programme in Nepal, Peru and Uganda

The Global Ecosystem-based Adaptation (EbA) in Mountain Ecosystems Programme was jointly implemented from 2011 to 2016 as a flagship programme of UNEP, UNDP and IUCN, funded by the Government of Germany through the International Climate Initiative (IKI), in partnership with the Governments of Nepal, Peru and Uganda. The programme was implemented at global level and at national level with pilot project work in mountain ecosystems in countries that are particularly vulnerable to climate change. Particular emphasis has been place on the economic and financing aspects of EbA. (UNDP 2017). In Peru, the inclusion of EbA in national public investment guidelines for biodiversity and

ecosystems promises far-reaching impact by mainstreaming EbA into government investments. In Uganda, EbA measures were used to bundle watershed and carbon services into credits, demonstrating that payments for Ecosystem Services (PES) is a relevant model for EbA financing. EbA measures that produce new ecosystem goods and services such as provision of plant products in Nepal or fibre from vicuna in Peru, provided an alternative source of financing and enhanced the sustainability of implemented measures (ibidem).

***Example:** Disasters as windows of opportunity for financing EbA, Northern America*

Several EbA related policy alignments undertaken in the most recent years took place after following a major disaster, which opened a window of opportunity for policy reform and innovation. For example, in 2013 the Hurricane Sandy Rebuilding task force developed a strategy emphasizing the need for environmentally sustainable and innovative solutions that consider ecosystem-based options in all federal Sandy infrastructure investments (Government of the United states of America, 2013, Monty et al. 2016). Afterwards multiple efforts have been done to help institutionalize the best practices learnt from the Hurricane Sandy rebuilding efforts on integrating ecosystem-based approaches into coastal resilience strategies, e.g. in 2015 the White House released a memorandum directing Federal agencies to factor the value of ecosystem services into federal planning and decision making. Other countries such as Canada, Japan, Chile, Senegal, Nepal and Thailand are pursuing similar goals.

4.6 Conclusions for EbA Mainstreaming

There is a strong momentum at the global policy level for EbA and, more in general, to link ecosystem management, DRR and CCA. At the same time there is a proliferation of Eco-DRR/CCA/NBS/EbA practices being implemented through community-based and field level projects. The biggest challenge is the translation of global policy commitments into national, transnational and local level policies and legal frameworks and the development of guidelines, technical standards, baseline approaches, institutional mechanisms and processes that encourage implementation. Integrating EbA into transboundary, national and regional adaptation policies may have multiple benefits (e.g. enhanced coordination, integration of EbA in multi-thematic cooperation frameworks).

However EbA integration into policies is only a first step for strengthening governance arrangements. There is a need to identify the hallmark characteristics of successful governance models as well as innovative institutional arrangements and policies for Eco-DRR/CCA EbA. The analysis presented here allows to identify some barriers and catalysts for mainstreaming EbA in mountain range governance.

The main **barriers** can be categorized as follows:

- **EbA** related barriers, including limited evidence about EbA measures effectiveness (compared to non EbA/standard measures) and unintended consequences of their adoption (e.g. in terms of long term sustainability), lack of unified and harmonized data, lack of standardized technical guidelines for designing and using EbA measures, insufficient EbA funding models and engagement of the private sector

- **Transboundary** related barriers, including different languages, differing political priorities, divergent funding mechanisms, competition for resources, mismatched timescales for EbA implementation, limited willingness to share data and expertise
- **Other barriers**, including antagonisms between different sectors (e.g. housing, climate change, and EbA), trade-offs between EbA and other measures.

The main **catalysts** can be categorized as follows:

- **Policy** related catalysts, including transnational declarations of intent; mainstreaming EbA in national legislation; EbA transboundary strategies and memorandum of cooperation (even if they seem to work less effectively than task oriented work); strong national policies relating to climate change.
- **Network** related catalysts, including cross-sectoral and task focused working groups involving different public agencies; support and facilitation of grass root initiatives (that can evolve e.g. from voluntary organizations to small medium size enterprises); support of NGOs, EbA local champions, citizen association and EbA focused alliances involving the public and private sector; transboundary networks that incorporate voluntary and proactive elements.
- **Finance** related catalysts, including support for EbA related business platforms; partnerships between private foundations and public funded initiatives; partnerships between public funded initiatives at inter/transnational and national or regional level; leverage on green and intersectoral (e.g. water, agriculture and environment) funding; making the case for EBa financing in other sectors, such as infrastructure (moving from grey to green); EbA targeted financial incentives.
- **Education and knowledge** related catalysts, including strengthening of scientific transnational and multidisciplinary networks; EbA related and project focused training/internships in Universities or higher education institutions; EbA virtual libraries and other on-line related tools

Moreover the analysis allowed to identify a set of **key governance principles** for EbA in transboundary mountain regions, divided in the following categories (also based on Martinez-Hernandez 2019): i) flexibility (monitoring and evaluation; integration of scientific and traditional knowledge); ii) multidimensional coordination (cross sectoral coordination; sharing of data and expertise; decentralization); iii) co-design of solutions and public participation (task focused working groups, education;); iv) law (dispute settlements; environmental law); (v) finance (PES, co-financing and other market instruments).

In conclusion EbA is neither standard policy nor institutional practice at present: mainstreaming is essential to facilitate replication and up-scaling of such approaches over time and over larger geographical areas. Evidence on these models and policies is missing (e.g. Estrella et al. 2016). To bridge this gap there is a need to: i) recognize adequate ecosystem-based approaches that can be used to address priority disaster risks and integrate them as key component of national disaster management plans; ii) clearly demonstrate the economic evidence for EbA; iii) develop user friendly standard frameworks for EbA, technical standards, guidelines that will make its identification easier and assist environmental

practitioners in identifying the DRR added value of their projects; iv) take advantage of national adaptation plans as an entry point to propose actionable integrated measures that target both risk reduction and biodiversity conservation; v) enhance the evidence base through research and education.

5. Regionalization efforts in Latin America

5.1 Catamayo-Chira transboundary river basin, Ecuador-Peru

The following points characterize the Catamayo-Chira transboundary river basin governance structure: 1) It is mainly an inter-governmental platform involving national water authorities of Ecuador and Peru, regional governments and water councils; 2) It has progressively evolved from a technical approach focusing on productive capacity-building programs towards more scientific and institutional consolidation; 3) The Spanish Agency of International Cooperation for Development (AECID), and more recently PNUD/GEF, have played a central role in coordinating the binational cooperation even if they are still facing sustainability challenges; 4) The binational cooperation is strongly connected to the historical context of the 1998 Peace Agreement between both countries.

Territoriality

The Catamayo-Chira transboundary river basin is located at the border between Ecuador and Peru. The spatial scope of this governance structure is directly articulated around a specific river ecosystem instead of a traditional state-centered territoriality. The basin watershed is located in the province of Loja (Ecuador) and ends in the Pacific Ocean in the province of Paita (Piura, Peru), over a distance of 315 km. Among the total area, 7.212 km^2 belong to Ecuador, including the cantons of Celica, Pindal, Macará, Sozoranga, Calvas, Espíndola, Gonzanamá, Quilanga, Loja, Catamayo, Paltas, Olmedo, Puyango and Zapotillo, while 9.987 km^2 belong to Peru, including the province of Sullana and part of the provinces of Ayabaca, Huancabamba, Morropón, Paita, Talara y Piura, in the department of Piura1.

The Planning, Management and Development Plan (POMD) of the transboundary basin mentions as a general objective: "to contribute to improve the basin management, in an efficient and effective way, through a negotiated integral and binational management of renewable natural resources for improving living conditions quality and consolidating peace between Ecuador and Peru".[14]

Formality and funding

On the basis of the peace agreement, authorities and citizens of both countries gave priority to the binational border action through a river basin perspective. In 2001, the Regional Governments of Piura and the Provincial Government of Loja, with the support of the Spanish Agency of International Cooperation for Development (AECID), initiated one of the first experiences of Binational Catamayo-Chira Basin management project, for the period 2001-2011. The project was funded by AECID for an amount of 4,365,854.25$.

[14] https://www.ecocuencas.com/catamayo-chira

Over these 10 years, various activities have been conducted in order to improve knowledge and generate information. This led to the elaboration of the Planning, Management and Development Plan (POMD), which defines the priorities for the period 2008-2023 and aims at promoting the integrated management of the basin1. The elaboration and implementation of the POMD had a cost of 470.000.000$ for a 15 years period. However, the POMD lacked the sufficient consolidation and was abandoned when AECID's project ended.

More recently, in October 2017, was created the Binational Commission for the integrated water resources management of the transboundary water basins between Ecuador and Peru2. This mechanism aims at governing the nine transboundary basins between both countries: Zarumilla, Puyango-Tumbes, Catamayo-Chira, Mayo-Chinchipe, Santiago, Morona, Pastaza, Conambo-Tigre and Napo. The Binational Commission is supported by the Integrated Water Resources Management in Transboundary Basins and Aquifers Puyango-Tumbes, Catamayo-Chira y Zarumilla project, coordinated by PNUD/GEF/ANA/SENAGUA3 for the period of 2012-2019. It is part of the Global Environmental Facility (GEF) International Waters component.

Even if none of the countries have signed an international agreement on transboundary waters, the objective of the project is to create sustainable institutions to encourage collaboration and peace at the border around water resources management.4 The Binational Commission should be consolidated as a transboundary institution to foster cooperation without a binding agreement due to the lack of interest and preparation of both countries. The evolution toward a binding agreement is still in discussion and could emerge in a long-term perspective.

Cross-sectoral and vertical integration

Two main institutions were initially contemplated in order to consolidate the vertical and cross-sectoral collaboration among Ecuador and Peru: the Binational Management Organism and the Binational Centre of Technical Training.

On the one hand, the Binational Management Organism was not formally conformed because of institutional reasons[15]. The National Water Secretary (SENAGUA) of Ecuador organized the III AdHoc Technical National Meeting in 2013 in order to impulse the structuration of an agreement for the conformation of the Binational Management Organism[16]. However, the differences in terms of normative and institutional frameworks between Ecuador and Peru contributed in a large way to weaken the consolidation of the initiative.

On the other hand, the Binational Centre of Technical Training (*Centro Binacional de Formación Técnica-CBFT*) was intended to strengthen local institutions in the regions of Piura (Mallares) and Loja (Zapotepamba).[17] The objective of the Centre was to provide

[15] "Informe de Evaluación Externa de Proyecto Binacional Catamayo Chira (2001-2011)", AECID, APCI, Plan Binacional de Desarrollo de la Región Fronteriza Ecuador-Perú, 2012.
[16] https://www.agua.gob.ec/senagua-impulsa-creacion-de-comision-binacional-girh-de-cuenca-hidrografica-transfronteriza-del-rio-catamayo-chira/
[17] http://planbinacional.gob.ec/gestion-integral-de-la-cuenca-binacional-catamayo-chira/

capacity-building to local governments in order to improve their productive development. However, due to a lack of continuity, the institution was not formally constituted.

The Binational Commission, created in 2017, is composed by the National Water Authority (ANA) in Peru, SENAGUA, the Ministries of Foreign Affairs, the Ministries of Environment, the Regional Governments in Peru and the Hydrographic Demarcations in Ecuador. On the Peruvian side, the Chira basin is included in the Water Resources Council of the Chira-Piura Basin (CRHC), conformed in 2011. On the Ecuadorian side, the Puyango-Catamayo basin is officially a hydrographic demarcation since the adoption of the 2008 Executive Decree No. 1088 that establishes the integrated water resources management approach.

The objective of the UNDP/GEF project is to centralize the management and planning of the transboundary basin through the Binational Commission, as the main institution absorbing the unachieved past experiences and institutions. While the institution is mainly inter-governmental, it is supposed to progressively evolve toward the basin level.

One pending task is the design and approbation of an Agreement in order to define conflict resolution and funding mechanisms. In terms of cross-sectoral integration, the main points of tension in the transboundary basin are related to mining contamination up-stream in Ecuador, and agribusiness, irrigation, dams and floods down-stream in Peru. Moreover, the actors aim to create a Technical Secretariat in charge of the institution and agreement implementation.

Another project coordinated by Aguas sin Fronteras aims to decentralize the management of the transboundary basin at the local governments level. The project is funded by the European Union through regional governments' cooperation.

CSO Participation

Civil society organizations' participation is considered through their inclusion in the basin councils of each country, which are members of the Binational Commission. However, the Commission has to be consolidated to allow the effective civil society participation.[18]

Moreover, civil society participation is facilitated through decentralized projects managed locally in each country and aiming at developing productive capacities and conservation activities. For example, there are two national (Celica-Motilon and Ayabaca-Lancuran) and one binational (Macara sub-basin) experiences of watershed environmental services, which aim to improve the information on water resources availability in the area and the possible protection and restauration activities. Down-stream, the populations are benefitting from agricultural and productive activities to improve soil management and irrigation. The evaluation report mentions the existence of an appropriation and empowerment process, with positive results in terms of natural resources conservation and socio-organizational capacity-building.[19]

[18] Interview with Sebastian Izquierdo, Binational Coordinator of the PNUD/GEF project, Quito, Ecuador, 13/05/2019.

[19] "Informe de Evaluación Externa de Proyecto Binacional Catamayo Chira (2001-2011)", AECID, APCI, Plan Binacional de Desarrollo de la Región Fronteriza Ecuador-Perú, 2012.

Science-policy interaction

The initiative is supported by the Bridge Andes program implemented by the International Union for the Conservation of Nature (IUCN)[20] and its International Law Centre. One of the main activities of the program aims to strengthen an information system on transboundary water resources in order to support decision-making and technical information sharing among governmental institutions. In 2015, the program worked on a study aiming at strengthening hydro-meteorological networks in three pilot basins. It also worked on identifying protection actions related to water ecosystem services in the Catamayo-Chira basin.

In the framework of the Integrated Water Resources Management in Transboundary Basins and Aquifers Puyango-Tumbes, Catamayo-Chira y Zarumilla project, the scientific results of the Transboundary Diagnostic Analysis related to the causes and impacts of integrated water resources management were launched, as well as the Strategic Action Plan aimed at defining strategic actions and projects in order to respond to the identified transboundary issues.

Climate change adaptation

South America holds three of the widest water basins of the world (Amazonas, Orinoco and Rio de la Plata) and one of the largest subterranean water aquifers (Guarani).[21] The region also holds 26% of the renewable freshwater, while having 6% of the world population. Water resources are increasingly threatened by various drivers: unsustainable land use practices, deforestation, contamination, ineffective water governance, infrastructure building, and climate change including melting glaciers and extreme climate events. Another source of impact is due to economic inequalities, urban-rural gap in water access and consumption, demographic growth and productive activities. In the Catamayo-Chira basin, 80.5% of the population lacks access to drinking water on the Ecuadorian side, and 49.5% lacks access to drinking water on the Peruvian side.

The transboundary Catamayo-Chira river basin was one pilot project of the EcoCuencas program funded by the European Union.[22] The program aimed to design a financial mechanism to support water conservation and climate change adaptation in the basin. The project was coordinated by the International Water Office, and integrated by various institutions including the National Water Authority (ANA) in Peru, the National Water Secretary (SENAGUA) in Ecuador, and AECID.

The main issues related to climate change identified in the Diagnostic are climate variability, floods and El Niño phenomenon. It led to the implementation of adaptation and hydrological risks reduction measures.

The PNUD/GEF project is also adopting an ecosystem approach. However, Peru is more oriented toward an infrastructural approach due to its irrigation and dams projects.

[20] https://www.iucn.org/es/regiones/am%C3%A9rica-del-sur/nuestros-proyectos/proyectos-en-ejecuci%C3%B3n/bridge-andes-construyendo-di%C3%A1logos-para-una-mejor-gobernanza-del-agua

[21] IUCN. BRIDGE Andes: Construyendo diálogos para una mejor gobernanza del agua, 2016.

[22] https://www.ecocuencas.com/catamayo-chira

Different financial mechanisms are discussed to support conservation and climate adaptation activities. One mechanism could be the creation of a binational water fund, similar to the existing national water funds. The objective is to provide financial sustainability to the Binational Commission when the international cooperation project will end.[23]

Institutional fit and Transition paths

Awareness on the need to manage transboundary basins between Ecuador and Peru emerged in 1971 with the subscription of the "Convenio para el Aprovechamiento de las Cuencas Binacionales Puyango – Tumbes y Catamayo – Chira por parte del Ecuador y Peru", which states the need to conform an Ecuadorian-Peruvian Mixt Commission.

In the framework of the Peace agreements, signed on 26th October 1998, the governments of Ecuador and Peru subscribed in Brasilia the "Acuerdo Amplio Ecuatoriano-Peruano de Integración Fronteriza, Desarrollo y Vecindad", a bilateral instrument to create the Binational Plan of Development of the Border Region.[24]

More recently, the Andean Strategy for the Integrated Water Resources Management was approved through Decision 763 by the Andean Council of Foreign Affairs Ministries in 2011.[25]

5.2 Trinational Program of Conservation and Sustainable Development of the Protected Areas Corridor La Paya - Güeppi - Cuyabeno – Colombia, Ecuador and Peru

The following points characterize the Trinational Program governance structure: 1) It has a strong ecosystem-based and transboundary component, involving three national protected areas of Colombia, Ecuador and Peru; 2) While it is an inter-governmental initiative, the Program also largely includes the participation of indigenous peoples in the decision-making structures and the activities implemented; 3) The international cooperation support has been decisive in consolidating the Program; 4) The Program is linked to the historical context of regional integration in the Amazon area.

Territoriality

The Trinational Corridor is located at the border between Colombia, Ecuador and Peru, along the Putumayo river basin.[26] Therefore, the program is initially organized around an ecosystem-based demarcation. It is composed by 36% of Colombia, 35% of Ecuador and 29% of Peru, over an area of 40.817,25 km^2.

The objective of the transboundary initiative is to "create a coordinated regional management model for the conservation and sustainable development of the Program management area and the influence of environmental, public and sectorial policies at the

[23] Interview with Sebastian Izquierdo, Binational Coordinator of the PNUD/GEF project, Quito, Ecuador, 13/05/2019.
[24] http://planbinacional.gob.ec/gestion-integral-de-la-cuenca-binacional-catamayo-chira/
[25] http://www.aguaparanaturaleza.org/index.php?page=gobernanza-del-agua
[26] Usma, J.S., C. Ortega P., S. Valenzuela, J. Deza & J. Rivas (Eds.). 2016. *Diversidad biológica y cultural del Corredor Trinacional de áreas protegidas La Paya - Cuyabeno - Güeppí Sekime. Colombia - Ecuador - Perú*. WWF. Bogotá D.C., Colombia. 333p.

national and regional level, through developing operative, technical and financial tools and mechanisms".[27]

Formality and funding

The strategical importance of the transboundary area was first recognized in 1979 by Ecuador, with the creation of the Fauna Production Reserve (RPF) Cuyabeno (Ministerial Agreement No 322); then by Colombia in 1984 with the creation of the National Natural Park (PNN) La Paya (Agreement Inderena No 015 and Executive Resolution No 160); and lastly by Peru in 1997 with the recognition of the Reserved Zone Güeppi (Supreme Decree 003-97-AG), leading to the creation in 2012 of the National Park (PN) Güeppi Sekime in the Communal Reserves of Huimeki and Airo Pai.[28]

In the framework of the First International Workshop of the Subnetwork of Amazon Protected Areas, held in Gamboa, Panama, in 2005, the representatives of the environmental systems of the three countries expressed the will to integrate the RFP Cuyabeno to the ongoing process between ZR Güeppi and PNN La Paya. A proposal was formulated toward the Neighborhood and Integration Commission between Colombia and Ecuador.

In 2005 started the Trinational Program of Conservation and Sustainable Development of the Protected Areas Corridor PNN La Paya – ZR Güeppi – RPF Cuyabeno. It was formalized through a Memorandum of understanding subscribed in July 13, 2011.

Various projects funded by the international and regional cooperation helped consolidating the Trinational Program, especially by the European Union, WWF, CAN, ACTO and GIZ:

- "Apoyo al Programa Trinacional Conservación y Desarrollo Sostenible del Corredor de las Áreas Naturales Protegidas La Paya (Colombia), Gueppí (Perú) y Cuyabeno (Ecuador)" in charge of OTCA-CAN-GIZ (2010-2012);
- "Un paisaje integrado de conservación y desarrollo sostenible: fortalecimiento de un SIRAP y territorios indígenas en la cuenca trinacional del río Putumayo" in charge of WWF-UE (2009-2013).[29] The three beneficiaries groups contemplated are the protected areas of each country and their national, regional and local representatives; indigenous communities and local organizations; and the peasant organizations (cooperatives, associations) of the region.

Various financial mechanisms are considered to support the Trinational Program (US$ 1,3millon in 2017): compensation measures for the use of natural resources, incentives for conservation, articulation with existing national conservation programs (Socio Bosque, REDD), consolidation of eco-touristic activities, design of environmental funds, certification schemes, and productive activities involving local communities. More funding is needed to support the Technical Committee's regional meetings and to implement the Trinational Program Action Plan.[30]

[27] Memorandum of understanding of the Trinational Program of Conservation and Sustainable Development of the Protected Areas Corridor PNN La Paya – ZR Güeppi – RPF Cuyabeno, 2011.

[28] http://www.wwf.org.pe/informate/involucrate/publicaciones.cfm?uNewsID=290534

[29] http://old.sernanp.gob.pe/sernanp/noticia.jsp?ID=1649

Cross-sectoral and vertical integration

The Program is structured around three main institutions: a Coordinating Committee (defines public policies and strategic orientations; composed by the three national authorities managing the protected areas of each country), a Technical Committee (technical orientations of the Corridor Strategic Plan; composed of the natural protected areas Directors), and a Technical Secretariat (coordination and operative role; rotation every two years).

The involved organizations and institutions are: the National Natural Parks of Colombia (Ministry of Environment and Sustainable Development), the Ministry of Environment of Ecuador, the National Service of Natural Protected Areas by the State (SERNANP) in Peru, the European Union, the Amazon Cooperation Treaty Organization (ACTO), the Andean Community of Nations (CAN), GIZ, Patrimonio Natural, the Protected Areas Promotion Fund of Peru (PROFONANPE), and the Spanish National Parks Network.

Transboundary governance is challenged by the sovereign constitution of each country. The Trinational Program seeks to respond to this challenge through concrete transboundary activities such as monitoring actions around natural resources.[31]

CSO participation

The Trinational protected areas overlap with indigenous territories, most of the time legally recognized and autonomous, justifying the wide inclusion and participation of these actors in the Program decision-making authority structure and in local activities such as tourism.

The Trinational Program led to the transformation of the Zona Reservada de Güeppí into a National Park and the creation of two communal reserves, Airo Pai and Huimeki, resolving various land tenure conflicts with indigenous peoples on the Peruvian Amazon. Similarly, it contributed to open a dialogue in Colombia (Conversatorio de Accion Ciudadana) leading to the improvement of territorial planning and natural resources management between State authorities and local communities. A safeguard plan for overlapping indigenous peoples was established in La Paya, Colombia, leading to the delimitation of indigenous territories in La Paya and the titling of territories in Güeppi. An agreement was established with three indigenous organizations (APKAC, ACILAPP and ACIPS), as well as with peasant communities of the buffer zone.

Different activities were led to strengthen the monitoring and control capacities of the indigenous communities, through the creation of various local committees and plans. Moreover, capacity-building was incentivized in relation to natural resources management, and the Centro Indígena Shuar Charap y la Comunidad Kichwa Zancudo Cocha, located in the RPF Cuyabeno, was integrated into the Socio Bosque Program.

Other forms of management in the region exist, which are compatible with environmental sustainability, such as the forest reserves in Colombia, the national and communal reserves in

[30] Interview with Telma Paredes, Ministerio del Ambiente del Ecuador (MAE), Quito, Ecuador, 23/05/2019.
[31] Interview with Telma Paredes, Ministerio del Ambiente del Ecuador (MAE), Quito, Ecuador, 23/05/2019.

Peru, or the areas under Socio Bosque arrangements in Ecuador. Moreover, different forms of land use and conservation coexist in the area: strict conservation for example in Colombia with the National Natural Park La Paya or in Peru with the National Park Güeppi Sekime; authorization for specific uses for example in the Communal Reserves Huimeki and Airo Pai in Peru and the Fauna Production Reserve of Cuyabeno in Ecuador.

Science-policy interaction

Environmental authorities are permanently collaborating with NGOs and the academic sector in order to generate information on natural resources management, conservation and sustainable development for local populations.[32]

Climate change adaptation

Actually, there is no specific project on climate change adaptation in the area. The last project was the Integración de Áreas Protegidas del Bioma Amazónico (IAPA) project including a climate change component. The ecosystem-based approach is relevant in terms of genetic connectivity and species habitats and is therefore included in all the Program actions, plans and studies.[33]

Institutional fit and Transition paths

The Amazon Cooperation Treaty (ACT), signed on July 1978 by Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela, is a legal instrument that recognizes the transboundary nature of the Amazon. The ACT reaffirms the Amazon countries' sovereignty and encourages, institutionalizes and guides regional cooperation between them. Its main purpose is to promote the harmonious development of the Amazon while incorporating the countries' Amazonian territories to their respective national economies, an essential condition for reconciling economic growth with environmental preservation.[34]

In 1995, the Amazon countries decided to institutionally strengthen the Amazon Cooperation Treaty by creating a Permanent Secretariat. The decision was enforced in 1998 with the approval of the ACTO Protocol of Amendment that officially instituted the Amazon Cooperation Treaty Organization (ACTO) as a mechanism responsible for enhancing and strengthening cooperation processes developed in the context of the Treaty.

5.3 Latin American Technical Cooperation Network on National Parks, other Protected Areas and Wildlife (REDPARQUES)

The following points characterize the REDPARQUES governance structure: 1) Whereas the network is integrated by nineteen Latin-American countries, it has a strong ecosystem-based and transboundary spatial scope with various projects articulated around the Amazon biome; 2) The network is strongly articulated around ecosystem-based and climate change

[32] Interview with Telma Paredes, Ministerio del Ambiente del Ecuador (MAE), Quito, Ecuador, 23/05/2019.
[33] Interview with Telma Paredes, Ministerio del Ambiente del Ecuador (MAE), Quito, Ecuador, 23/05/2019.
[34] http://otca.info/portal/tratado-coop-amazonica.php?p=otca#

adaptation programs, in the framework of the Convention on Biological Diversity (CBD) at the international scale; 3) The wide territorial scope, as well as the technical character of the network, limit the effective participation of civil society and indigenous organizations in decision-making; 4) The support of international cooperation projects and funding, as well as international agreements and conventions, is decisive for the network sustainability.

Territoriality

The network is integrated by nineteen Latin-American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay and Venezuela. However, it is essentially articulated around the Amazon biome due to various ecosystem-based and climate change adaptation programs, as detailed below.

Formality and funding

In 1983, the countries of the region, with the support of the Food and Agriculture Organization of the United Nations (FAO), created REDPARQUES. Its creation proceeds from the need to improve the management of protected areas in Latin America and the willingness of the countries for sharing more efficiently technical knowledge and experiences available in the region.

The network receives financial support from the Andean Community of Nations (CAN), OTCA, IUCN and WWF.

Cross-sectoral and vertical integration

REDPARQUES' leadership rests in its National Coordinators, who are appointed by the governments of the member states and are the directors of the national parks and protected areas systems. Every two years, the National Coordinators elect a Regional Council among its members, which is chaired by a Regional Coordinator. Until October 2019, Peru assumes the regional coordination of the network.

FAO is the Technical Secretariat of the REDPARQUES since its inception.

Two subnetworks have been created under REDPARQUES: one is the Subnetwork of the Amazon Protected Areas (SURAPA) in 1991, and the other one is the Subnetwork of the Southern Cone Fauna in 1992.[35]

The network is also structured around three working groups on marine and coastal areas, tourism and financial sustainability. These working groups were defined according to the shared interests of the nineteen countries beyond their national specificities.[36]

CSO participation

Civil society organizations and indigenous peoples' participation in the network is indirectly ensured through the national and local participation mechanisms of each country.

[35] http://www.fao.org/tempref/GI/Reserved/FTP_FaoRlc/old/redes/parques/default.htm

[36] Interview with Benjamin Lau, asesor técnico del Consejo Directivo de SERNANP Peru y de la REDPARQUES, via Skype, 20/05/2019.

In the last five years, new and diverse legal frameworks emerged which seek to improve the conditions of participation, the rights of the Indigenous Peoples to benefit-sharing on the use of their knowledge on biodiversity resources, territorial rights, rights to prior consultation, among others. However, a remaining challenge is the creation of binding strategies or mechanisms to operationalize these legal bodies in all their dimensions. Of the countries in the Amazon region, almost all are signatory countries of the Nagoya Protocol, but only Peru has ratified it.

Science-policy interaction

REDPARQUES is a technical mechanism consisting in public and private institutions and specialists from the member countries of the region working in the realm of protected areas and wildlife. Its objective is to progressively increase their technological and management capacity, based on knowledge-sharing among members, using their own technical, human and financial resources.

The results of REDPARQUES' activities have significantly contributed to the development and technical capacity of the professionals from the national institutions responsible for the management of national parks and other protected areas. This contribution is reflected in the increase of technical cooperation among the countries and the participation in projects and knowledge-sharing.[37]

Together with the Government of Colombia and IUCN, REDPARQUES organized the First Latin American Congress of Parks and other Protected Areas in 1997 in Santa Marta, Colombia. The Congress provided an important opportunity to discuss and exchange technical and scientific information and promote regional strategies for national parks and other protected areas. The second Latin American Congress of Parks and other Protected Areas took place in Bariloche, Argentina, in 2007, counting among its organizers the Government of Argentina, UNEP and IUCN, its principal targets being the monitoring of the Action Plan from the First Congress and advances in the region of the Durban Action Plan (2003).

Climate change adaptation

The Amazon biome provides fundamental ecosystem services that support its inhabitant's livelihoods and contribute to Amazon countries' economies. These services include climate stabilization, carbon sequestration, provision of water, food, timber, genetic resources, non-renewable natural resources and cultural services.[38]

In 2008, based on the progress of the Subnetwork of the Amazon Region Protected Areas and OTCA, and the implementation of the CBD Working Program on Protected Areas, REDPARQUES assumed the leadership of the "Vision for the conservation of biological and cultural diversity of the Amazon area based on ecosystems".[39] This approach was prepared in

[37] Interview with Benjamin Lau, asesor técnico del Consejo Directivo de SERNANP Peru y de la REDPARQUES, via Skype, 20/05/2019.
[38] "Protecting the Amazon can protect the Climate", WWF Living Amazon Initiative's Project 'Amazon Biome: Natural Solution to Climate Change', November 2014.
[39] http://redparques.com/quienes-somos/

partnership with the CBD Secretariat, WWF and IUCN, with the participation of OTCA and CAN.

An Action Plan (2010-2020) was elaborated in order to promote its implementation and was politically supported by the Ministries of Environment of the Amazon countries and OTCA during COP10 of the CBD in Nagoya. The Action Plan 2010-2020 for the Amazon biome established under the framework of the Regional Ecosystemic Vision for Conservation of the Biological and Cultural Diversity of the Amazon Biome, has made it possible to move forward in the implementation and fulfillment of all the commitments made, advocating at the same time through clear messages for the importance of biodiversity and conservation through protected areas and other methods, such as adaptation and mitigation of the effects of climate change and fulfillment of the Millennium Development Goals.

This vision is developed around the following four key components of the Working Program on Protected Areas: conservation opportunities, the integration of the vision of indigenous and local communities, the efficient management of the protected areas, and strategies for sustainable financing for the protected areas.

Two main projects are implemented under the Amazon Vision:

- Integration of Amazon Biome Protected Areas (IAPA) is a project funded by the European Union, and in charge of FAO, IUCN, WWF and UNEP, which seeks to create a network around the protected areas systems located in the Amazon region.[40] The project started as a support to the regional initiative Vision for preserving the Amazon biome diversity based on the ecosystems, proposed in 2008 by REDPARQUES. Its objective is to contribute to the increased ecosystem resilience to the effects of climate change by keeping the provision of goods and services that benefit biodiversity, communities and local economies. It has a strong landscape approach, meaning the integration of protected areas inside the broader territory, the connection of regional and local governments and local communities, and social and economic development beyond conservation.
- Protected Areas, Natural Solution against Climate Change (NASCC) is a project funded by the Ministry of Environment of Germany (BMUB), as part of the implementation of the Vision for the Conservation of the Amazon by REDPARQUES and the WWF Living Amazon Initiative. The protected areas of the Amazon are central in helping communities and nature in the adaptation to climate change. They build resilience and help mitigate the impacts of the events of a changing climate, and ensure the provision of ecosystem services and protect biodiversity. The protected areas should be included in climate change strategies and development plans in the Amazon countries in order to facilitate the development of resilience and promote a better environment and a better climate.

In November 2018, in the framework of COP14 under the CBD, was launched the Latin-American Alliance to strengthen Protected Areas[41] (ALFA), aiming to implement Aichi Target 11 in the region: "By 2020, at least 17 per cent of terrestrial and inland water areas and 10 per

[40] REDPARQUES. 2016. Regional report implementation of the program of work on protected areas 2011 - 2015: Amazonian biome region. 115 p. Bogota Colombia.

cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape."[42] The Alliance was launched by REDPARQUES, through the IAPA Program, the Amazon Vision, Pronatura Mexico, the World Commission on Protected Areas and IUCN, with the support of the CBD Secretariat.

Institutional fit and transition paths

The conservation of nature and the values associated to protected natural areas is a priority within the political agendas of the countries, due to the need to strengthen the socio-ecosystems through the protection of those areas of particular importance for biological diversity and the ecosystems services. With this purpose, in 2010, the 2011-2020 Strategic Plan for Biological Diversity (Aichi Goals) of the CBD was approved. It contains five strategic objectives and twenty specific goals. These goals are set out in the National Biodiversity Plans and Strategies (NBSAPs).

The 2011-2020 Strategic Plan is an important reference for the collective building of the Sustainable Development Goals (SDGs), taking into account that i) nature provides fundamental elements for human survival, ii) species and ecosystems have a limited capacity to adapt to change which is a challenge to reduce the vulnerability with regards to global change factors; and iii) nature must be taken into account in the decision-making and the formulation of public policies.

It is worth mentioning that to this regard, at the regional level, there is the Andean Decision 391 of 1996 that establishes the common regime on the access to the genetic resources for the Andean Community countries which is the reference in several countries of the Amazon Region.

[41] http://laestrella.com.pa/vida-cultura/planeta/alianza-latinoamericana-para-fortalecer-areas-protegidas/24094192

[42] https://www.cbd.int/sp/targets/rationale/target-11/

6. The way forward: Transition paths for regional mountain governance in the Andes

At the Andean Mountain Initiative Ministerial Consultation held in Quito, Ecuador, on 19-20 November 2018, consultation participants shared and discussed their perspectives on regional mountain governance. The discussion involved the positioning on a series of matrices prepared by the authors of this study.

The results revealed several points of consensus but also a number of issues, where participants advanced different perspectives. The following sections build on the goals held in common – a programmatic approach for the medium term, a formal agreement in the longer term – and outlines a series of transition paths for reaching these goals.

The transition paths take into account the MRG profiles established in Section 3, building on the six dimensions of the regional governance opportunity structure, referring back to examples from mountain governance around the world. The transition paths pay special attention to the challenge of mainstreaming ecosystem-based adaptation, which until now have mostly been implemented at the local level.

The section concludes with some final considerations for the way forward. It reiterates the argument that there is no single recipe for mountain range governance that can easily be transferred from one context to another, but that their institutional innovations and collaborative practices that, given due attention to the regional governance opportunity structure, national and regional ownership, and adequate international support, can help foster cooperation in the Andes.

6.1 Stakeholder perspectives

During the stakeholder participation at the AMI Ministerial Consultation, feedback was collected with regards to governance feature considered desirable to have in place within four years (medium term) and within eight years (long term).

Four-year horizon

- There was a consensus that within four years, MRG in the Andes should be based on a political-administrative delineation (→ **territoriality**); however, the tension between a political-administrative delineation and an approach taking ecosystems or landscapes was raised.
- Less consensus existed with regard to the binding nature of governance in the medium-term (→ **institutional formality**).
- While there was broad agreement on the need to involve civil society (→ **CSO participation**), some participants considered that the inclusiveness of the term civil society needed clarification, in particular with regard to the private sector and local government. The suggestion was made that CSO participation could letigimate the process, but that such participation should be guided, rather than completely open, in

part because many decisions relating to mountain range governance are ultimately the responsibility of governments.

- Participants from all but one country argued that the involvement of local government is essential, that the local level is where civil society in the sense of "people power" was best integrated, and that a multilevel coordination was necessarily part of a sound governance setup (**→ vertical integration**).
- All participants agreed that science and scientists should play an important role and many maintained that scientific advice should be provided by a permanent and relatively autonomous body that would offer useful and practical knowledge (**→ science-policy interface**).
- Finally, climate change adaptation was considered to be an important thematic entry point (**→ climate change adaptation**) and that ecosystems-based adaptation should play a role, but given the diverse understandings of EBA, it was clear that EBA should be part of a larger portfolio of governance activities (**→ sectoral integration**). It was also pointed out that the balance between traditional ("grey") and ecosystems-based adaptation should be carefully tailored to local contexts, taking into account the special needs of developing countries. As noted above, the nature and effectiveness of EbA measures will also depend on whether they are implemented in a low emissions scenario or a high emissions scenario, given that certain ecosystems central to a given EbA measure are also highly sensitive to climate change and therefore likely to reach their functional limits under current emissions (IPCC 2019).

Several of the MRG dimensions were clearly seen as related to each other. For example, the nature of CSO participation was explicitly considered to depend on the formality of governance arrangements; implicitly, the same could be said about the science-policy interface.

The figures below illustrate the ways in which country representatives considered some of the relations between these dimensions.

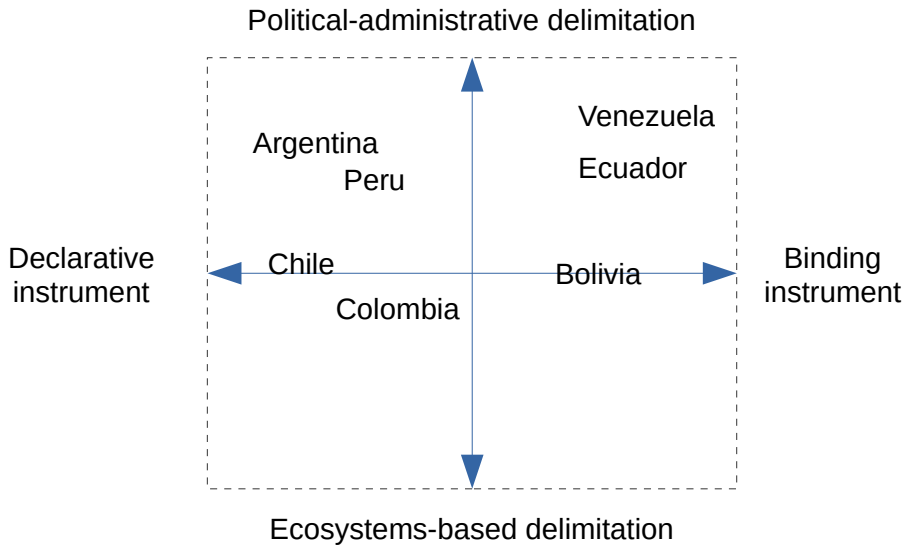

Figure 1: Territoriality and institutional formality, 4-year horizon

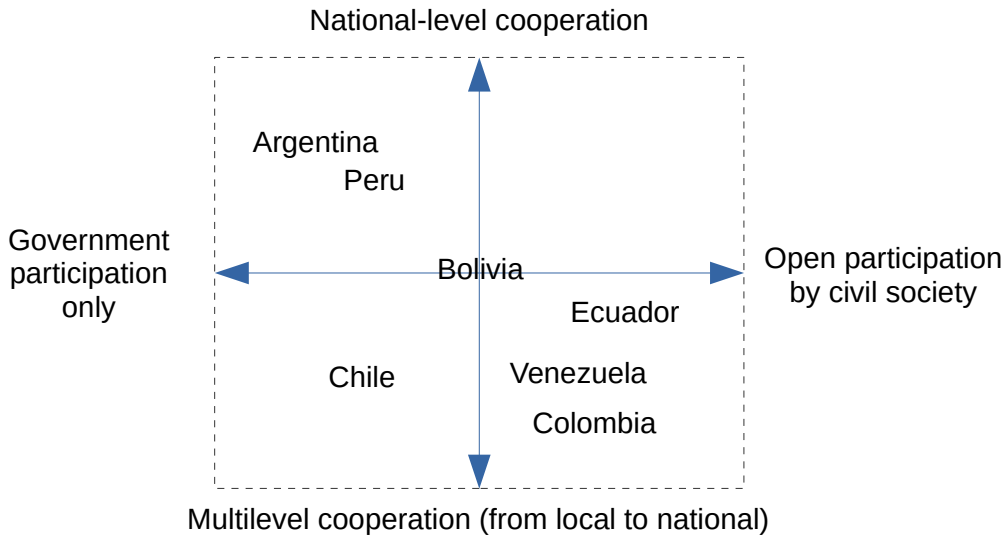

Figure 2: Vertical integration and civil society participation, 4-year horizon

Figure 3: Civil society participation and the role of science, 4-year horizon

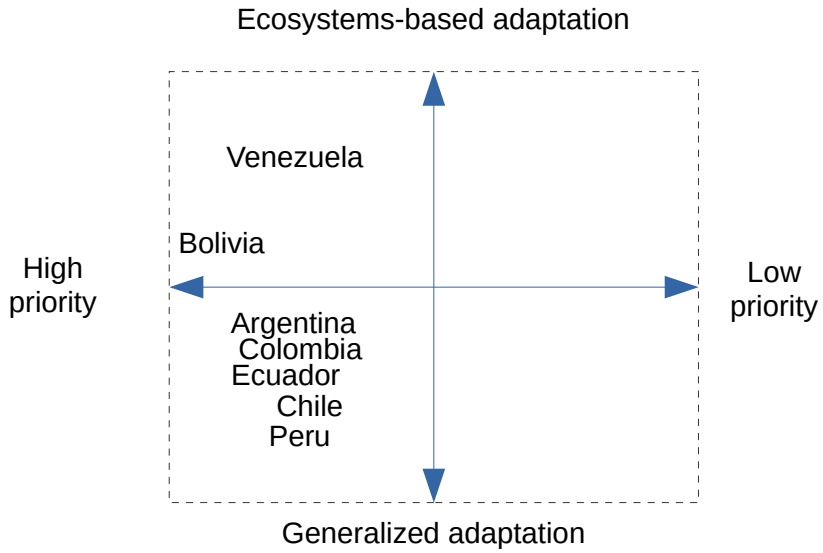

Figure 4: Character and priority of climate change adaptation, 4-year horizon

Eight-year horizon

- Most countries felt that Andean mountain governance should be based on a formal instrument within the next eight years (**→ institutional formality**).
- Representatives from all but one country expressed the desire to move towards a multilevel governance model; since the particular modalities of such a model were not specified, the position of the country arguing for a strong role of the central government constitutes more a difference in degree than in kind (**→ vertical integration; → CSO participation**).
- The specific role of civil society was more contested in discussions about the eight-year perspectives than the four-year perspectives. This could be explained on the basis of the structuring influence that initial CSO participation arrangements will have on the MRG setup that is expected to emerge (**→ CSO participation; → science-policy interface**). For instance, if civil society were to be play a decisive role in decision-making processes during the first four years, they may not accept to be excluded from such processes if they were to move to the intergovernmental realm in the context of a treaty.
- Given the higher degree of uncertainty associated with longer time horizons, the nature and role of the science-policy interface also prompted more discussion with regard to the four-year horizon than to the eight-year horizon. On the one hand, it was recognized that scientists are not always impartial, on the other hand some participants felt that scientific evidence needed to guide decisions where citizens and/or civil society lack the requisite knowledge, but also that decision-makers will need to be pay attention to science-derived climate change scenarios, where harm to livelihoods and ecosystems is forecast (**→ science-policy interface; → climate change adaptation**).
- The discussion of eight-year perspectives was dominated by questions of access to decision-making processes and the role of science, leaving little room (and time) to other issues. Divergent understandings of adaptation, for instance, did not reemerge, if it was not for a sense that adaptation would need to be seem even more broadly and holistically (**→ sectoral integration**).

In general, the discussions revealed consensus on some points and differences on others. This is not surprising given the stakes; it is also not uncommon when recalling mountain range governance experiences elsewhere.

Here too, several dimensions were seen and discussed in relation to each other, as illustrated in Figures 5-8 below.

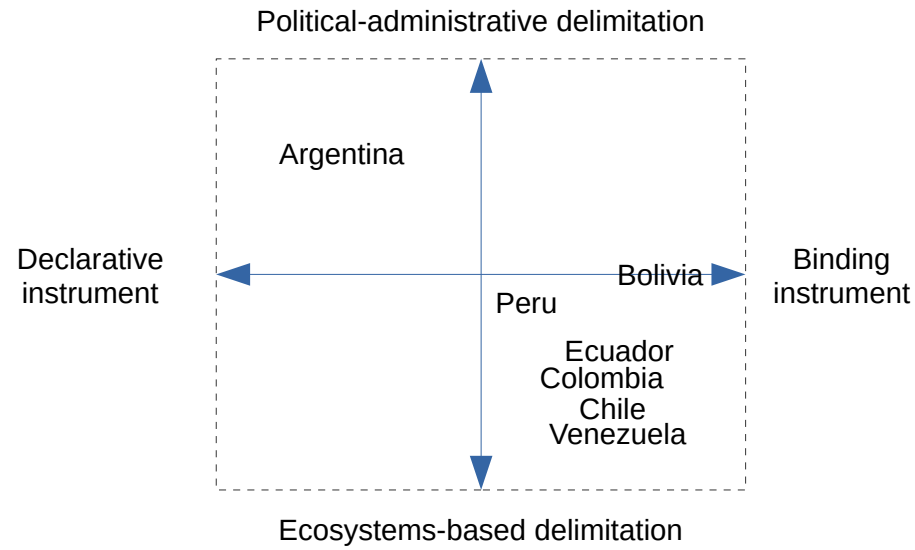

Figure 5: Territoriality and institutional formality, 8-year horizon

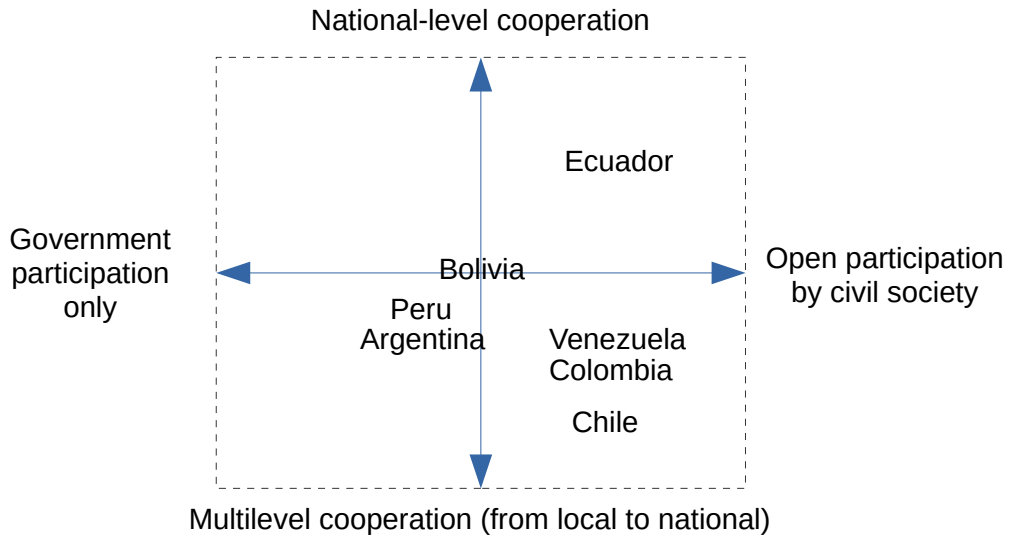

Figure 6: Vertical integration and civil society participation, 8-year horizon

Figure 7: Civil society participation and the role of science, 8-year horizon

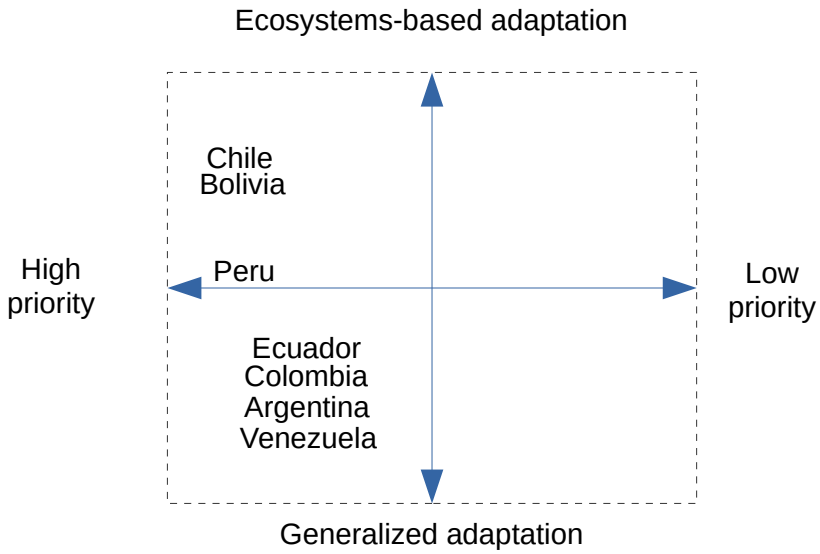

Figure 8: Character and priority of climate change adaptation, 8-year horizon

In the next section, the perspectives of stakeholders taking part in the Ministerial Consultation are placed in the context of such experiences. The objective is not to propose a clear cut roadmap but to identify and evaluate a series of transition paths that take into account the prevailing opportunity structure so as to best match experiences elsewhere to the Andean context.

6.2 Medium-term and long-term goals and transition paths

6.2.1 Medium-term (4-year horizon)

Territoriality (T)

Mountain range governance never emerges in a vacuum. As a result, spatial referents for addressing mountain-specific problems tend to be linked to, or articulate with existing political-administrative boundaries. At the same time, a mountain range never neatly follows existing political-administrative boundaries, and mountain-specific issues typically have their own spatial logics (e.g. the management area for transboundary water bodies may not be the same as for transboundary transport infrastructures). As a result, any mountain range territoriality will always be a complex constellation of multiple functional territories (sometimes called project regions). The degree to which lend themselves to governance and management activities will depend on the institutional histories of the respective territories.

> **Transition Path T-1.** Using any of the available global mountain delineations, the Andean mountain region is "ecoregionally" defined; countries decide at which subnational administrative level ecoregion-adherence is located (→ **example**: Alpine Convention; transboundary landscape approach by ICIMOD)
>
> **Transition Path T-2.** The AMI's spatial scope is defined "as needed" in the context of particular programs and projects. These need not be rangewide programs or projects: the Andean mountain region as it pertains to the AMI becomes an assemblage of partially overlapping functional regions. Some may link to existing programs (→ **examples:** Programa INTERREG V-A España-Francia-Andorra, POCTEFA; Caucasus); others may develop new territorial delineations (→ example: Alpine-Carpathian Corridor).

Institutional formality (IF)

The participants in the ministerial consultation were almost evenly divided with respect to whether a formal, legally binding instrument should be established in the medium or the long term. Negotiating such an instrument in four years is possible and hence this transition path is included here. Even if a formal instrument such as an intergovernmental treaty is to be pursued only in the longer term, however, cooperation in the medium-term is more effective and efficient if based on some commonly understood principles, including a governance structure that defines key actors and their roles, ensures regular meetings and outcomes, establishes work plans, provides for minimum funding, and incorporates a review process designed to guide regional collaboration towards the longer term goals.

> **Transition Path IF-1.** A formal, comprehensive, legally binding instrument is negotiated. It may take the form of a framework convention with protocols (→ **examples:** Alpine Convention, Carpathian Convention), where the framework convention establishes goals, objectives, and definitions: rights and obligations; governance mechanisms including instrument bodies, meetings and nature of and participation in decision-making processes; financial contributions and funding instruments; and monitoring, evaluation, and conflict resolution.

Transition Path IF-2. A very general document establishes basic goals and working principles and provides only for regular meetings. Although proven useful in many cases of mountain range governance, a permanent structure to service such meetings may or may not be necessary. The current setup with an Assembly of Countries, regular ministerial meetings, and CONDESAN ensuring secretariat functions is a good point of departure, as it has been used as a conduit to produce such outputs as the Strategic Agenda on Climate Change Adaptation in the Andes. This transition path emphasizes political dialog (→ **examples:** Working Groups for the Pyrenees, Working Group for the Jura, 3 different Working Groups for Alpine subregions, all established in the 1970s and 1980s – albeit by subnational, not national governments – and many of them having evolved into more formal institutions in the context of European Union programs). The advantage of this transition path is that it can provide the foundation for developing a more formal instrument later; the disadvantage is that civil society organizations may have limited access.

Transition Path IF-3. In contrast to an institutional arrangement that emphasizes political dialog, a second transition path points towards a more programmatic structure, with institutional arrangements geared to facilitate the development or to implement projects funded especially by bilateral and multilateral donors, as well as support fundraising and program/project collaborations between partners from AMI countries (→ **example:** ICIMOD, Sustainable Caucasus). The advantage of this path is the flexibility to respond to funding opportunities as well as greater openness to civil society organizations. Am additional advantage is that it allows for a greater degree of (decentralized) experimentation and lesson learning; however, the challenge lies in the integration of such lessons at the regional level (→ **example:** European Strategy for the Alpine Region). An additional risk to note is that a supporting structure may take on a life of its own, begin to compete with local or national initiatives, and neglect the political dialog. This transition path fits well with transition path T2.

Sectoral integration (SI)

Sustainable mountain development implies the need for enhanced coordination of sectoral policies and programs. Many mountain range governance arrangements do indeed cover multiple sectors (See Table 2, Section 3.2.3) yet sectoral integration remains a challenge. In the context of sustainable development, research on the Swiss Alps suggests that integration is strongest at intermediary administrative levels between the municipal and the national levels (Balsiger and Ingold 2016); additionally, sectoral integration tends to be stronger where territorial approaches to public policies prevail, such as in the case of watershed management. Sectoral integration in a transboundary context can take two forms, which are the distinguishing element in the two transition paths SI-1 and SI-2.

Transition Path SI-1. Sectoral integration is organized along *heterarchic* lines, where coordination occurs at the interface of transboundary, overlapping functional regions (project regions). Coordinating agents are part of regional institutions, which may include working groups attached to regional instruments. The advantage of this model is that the recognition of transboundary dynamics is built into coordination activities;

the disadvantage is that regional coordinating actors may not have sufficiently strong links to national and local policy making and implementation.

Transition Path SI-2. Sectoral integration follows a *polycentric* logic, where coordination occurs at the national and/or subnational levels (multiple countries: multiple centers). Common and shared coordination concerns or needs are shared between national actors, either directly or via regional governance structures (→ **example:** Carpathian Convention). The advantage of SI-2 is that coordinating actors are closely linked to policy making structures and can therefore more easily address cross-sectoral concerns. They may also be more accessible to non-governmental actors. On the other hand, traditional administrative fragmentation may undermine integration efforts and transboundary dynamics are less readily prioritized.

Vertical coordination (VI)

As the AMI stakeholder consultation showed, defining the respective roles of local and national government is an important ingredient in mountain range governance but also a difficult balancing act in regional collaboration between countries that that different political cultures and experiences in this respect (→ **example:** Alpine Convention). As vertical coordination is often anchored in national constitutions (as is the ability of subnational governments to engage directly in international collaboration with subnational governments in other countries), far-reaching transitions in the short term may be difficult to obtain. For this reason, the two possible transition paths focus only on parts of a larger multilevel model.

Transition Path VI-1. Strategic/programmatic regional-national coordination: since regional governance structures are typically initiated and maintained by national level actors – foreign ministries or line ministries – vertical coordination between a mountain range governance body such as the AIM Assembly of Countries and national governments is built into the agreement. Such coordination can be of a strategic nature, for example explicitly seeking policy harmonization, or of a more programmatic nature, for example joint implementation of a regional strategy or action plan. In the short term, the latter is rather more likely.

Transition Path VI-2. Programmatic regional-national-local coordination piloting: where national constitutional parameters do not provide for extensive vertical coordination, or do not provide constitutional status to all relevant actors (as is sometimes the case for cities), vertical coordination may be promoted in the limited context of particular programs or projects. This approach aligns particularly well with the polycentric logic of sectoral integration, where transboundary functional regions are by nature less permanent structures.

Civil society participation (CSP)

As this was one of the more contentious issues in the stakeholder consultation, more than two transition paths may need to be envisioned. Sections 3 (MRG around the world), 4 (EBA) and 5 (Regionalization in Latin America) reveal numerous examples of successful CSO

participation. In a four-year perspective, which corresponds to an average duration of a project cycle, there is thus ample room for CSOs to get involved. A difference has to be made, however, between participation in agenda setting, policy making, programming, implementation, and evaluation. The two transition paths differentiate between agenda setting / policy making and implementation.

> **Transition Path CSP-1.** CSO roles in agenda setting and policy making can take multiple forms, each contributing in is own way to maximizing the integration of diverse perspectives and experiences as well as to enhancing the legitimacy of governance arrangements. Possible mechanisms include accreditation for participation in governing body meetings (with or without voting rights), participation in working groups that elaborate strategic plans or proposals for consideration by MRG governing bodies (→ **example:** Alpine Convention).

> **Transition Path CSP-2.** The implementation of activities in support of sustainable mountain development opens a broad spectrum of opportunities for participation by a wide variety of CSOs; the more informal the MFG arrangement's approach to territoriality (T-2) and the more emphasis that is placed on polycentric approaches to sectoral integration (SI-2), the greater the opportunity for CSO participation in MRG implementation.

Science-policy interface (SPI)

Scientists have traditionally played a role in regionalizing knowledge of mountain areas but they way they have organized themselves and interacted with governance processes has varied considerably. Debarbieux et al (2014) have differentiated between four types of "scientific collectives", two of which can be considered as being suitable candidates for AMI transition paths: (i) specialized scientists independent of a regional governance initiative (→ **example:** University of Central Asia); (ii) scientific collective established as counterpart of a regional governance initiative (→ **example:** Science for the Carpathians); (iii) Scientific collective established to be counterpart of planned or abandoned regional governance initiative (→ **example:** SEEMore); and (iv) Techno-scientific network established to meet data specific information demands of regional governance initiatives (→ **example:** Transboundary Statistical Observatory of the Jura).

> **Transition Path SPI-1.** Scientific collective established as counterpart of a regional governance initiative. Insofar as participants in the ministerial consultation have expressed the desire for scientific knowledge to be useful and practical, several existing scientific collectives in the Andes could be suitable, possibly in the form of a loose consortium.

> **Transition Path SPI-2.** Techno-scientific network established to meet data specific information demands of regional governance initiatives. One area where significant advances in scientific research and data sharing has been made is observation (→ **examples**: (1) A scientific collective that would support the work of AMI could build on the proposed AmeriGEO (formerly AmeriGEOSS), a framework that seeks to promote collaboration and coordination among the GEO Members in the American continent,

"to realize a future wherein decisions and actions, for the benefit of the region, are informed by coordinated, comprehensive and sustained Earth observations and information".[43] AmeriGEOSS proposes to focus its efforts on four 'Societal Benefit Areas' (SBAs) selected and prioritized by the Americas Caucus country-members: (i) agriculture, associated with climate variability, climate change, and food security; (ii) disaster risk reduction, particularly for data exchange and products associated with early warnings; (iii) water, associated with the management approach of water resources and data management; (iv) biodiversity and ecosystem monitoring including biodiversity observation in coastal, marine, and continental habitats. (2) Additional contributions could come from GEO-GNOME in the context of the 2020-2022 GEO Work Programme, given the expectation that GEO Initiatives also establish links with the Regional GEOs).

Climate change related ecosystem-based adaptation (EBA)

As noted in Section 4, integrating EbA into transboundary, national and regional adaptation policies may have multiple benefits, yet this is only a first step for strengthening governance arrangements. The transition paths for incorporating EbA in MRG have to tackle the barriers identified in the conclusions of Section 4. Some of these are cross-cutting challenges, including the limited availability of evidence about EbA measures effectiveness or traditional antagonisms between key sectors such as residential development and disaster risk reduction. Others can be linked to catalysts in the following *complementary* transition paths:

Transition Path EBA-1. Policy related catalysts, including transnational declarations of intent; mainstreaming EbA in national legislation; EbA transboundary strategies and memorandum of cooperation; and strong national policies relating to climate change. (→ **example**: EbA upscaling in Peru)

Transition Path EBA-2. Network related catalysts, including cross-sectoral and task focused working groups involving different public agencies; support and facilitation of grass root initiatives (that can evolve e.g. from voluntary organizations to small medium size enterprises); support of NGOs, EbA local champions, citizen association and EbA focused alliances involving the public and private sector; transboundary networks that incorporate voluntary and proactive elements.(→ **example**: Isar river ecosystem-based restoration)

Transition Path EBA-3. Finance related catalysts, including support for EbA related business platforms; partnerships between private foundations and public funded initiatives; partnerships between public funded initiatives at inter/transnational and national or regional level; leverage on green and intersectoral (e.g. water, agriculture and environment) funding; making the case for EbA financing in other sectors, such as infrastructure (moving from grey to green); and EbA targeted financial incentives.(→ **example**: Global ecosystem-based Adaptation in mountain ecosystems programme in Nepal, Peru and Uganda)

[43] http://www.earthobservations.org/documents/gwp20_22/AMERIGEO.pdf

6.2.2 Long-term (8+-year horizon)

The particular nature of a regional governance opportunity structure will make some short-term transition paths more likely than others. However, each transition path will in turn influence the evolution of the regional governance opportunity structure. For this reason, not all combinations of short term transition paths will be equally feasible (for examples, see Abildtrup et al. 2006, Barnett et al 2014, Kuzdas and Wiek 2014, Pretorius 2017). Hence, careful analysis of the likely future consequences (path dependence) of any MRG is strongly advised.

This section brings together three elements that jointly provide guidance for the development of a roadmap for Andean MRG: (1) stakeholder perspectives, (2) path dependence matrix, and (3) the regional opportunity structure.

Stakeholder perspectives

Figures 9-12 represent the direction of perspectives from a 4-year horizon to a 8-year horizon, i.e. the overlay of Figures 1-4 and Figures 5-8, respectively. The directions are placed in the same matrices as Figures 1-8; the Abbreviations represent the countries: A (Argentina), B (Bolivia), Ch (Chile), Co (Colombia), E (Ecuador), P (Peru), and V (Venezuela).

The diachronic synthesis of Figures 9-12 will be converted to an index that incorporates the center of gravity[44] of the positions as well as the degree of consensus.[45] These indices will then be used, together with insights from the regional opportunity structure, to relativize the results from the transition path matrix analysis below.

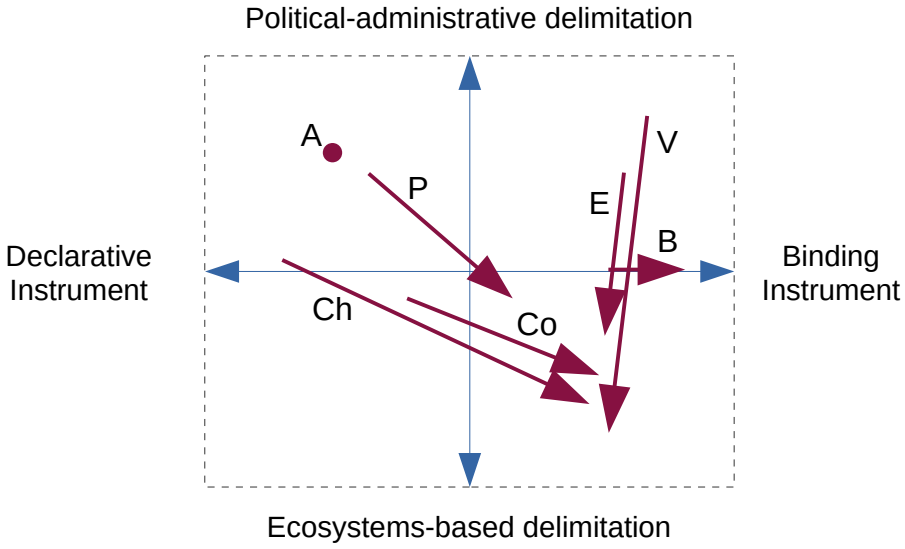

Figure 9: Territoriality and institutional formality, stakeholder goals

[44] The center of gravity is calculated by averaging the positions along the x-axis and y-axis; each country is given the same weight.

[45] The degree of consensus is represented as the standard deviation of the positions along the x-axis and y-axis; each country is given the same weight.

Figure 9 demonstrates that five of the seven stakeholder positions largely coalesce towards the goal of establishing a binding instrument with an ecosystems-based delimitation; for Argentina, the goal remains the same (a declarative instrument with a political-administrative delimitation) and for Bolivia, an instrument combining political-administrative delimitations should become slightly more binding did not change despite very different starting points.

=> Center of gravity: the two-dimensional average of the positions is clearly in the bottom right quarter, one-third of the distance between the origin of th graph and a binding instrument and one-quarter of the distance between the orgin and an ecosystems-based delimitation.

=> Degree of consensus: the standard deviation of the center of gravity of both axes is around two-fifths of the distance between the origin and the edges of the graph.

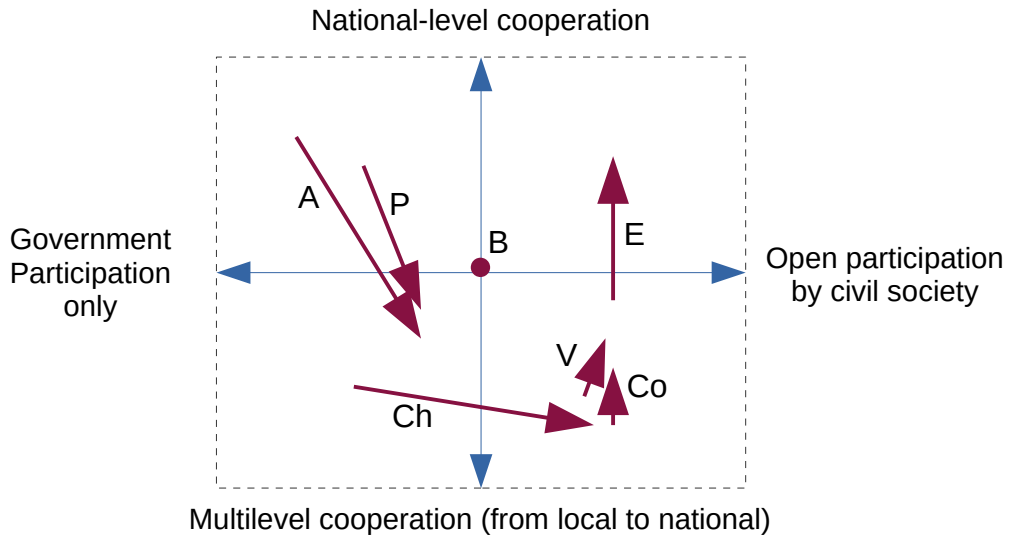

Figure 10: Vertical integration and civil society participation, stakeholder goals

By contrast, Figure 10 shows much less coalescence. Whereas Argentina and Peru seek government participation only but move from national-level to multilevel cooperation, Chile, Colombia, and Venezuela seek open participation by civil society in the longer term, Ecuador as well but aim for an evolution from multilevel to national-level cooperation; Bolivia's position remains unchanged at the origin of the graph.

=> Center of gravity: the average of the positions is located in the bottom right quarter (open participation by civil society and multilevel cooperation), about one-fifth the distance between the origin and open participation by civil-society, and two-fifth of the distance between the origin and multilevel cooperation.

=> Degree of consensus: although the direction of the evolution of perspectives is more heterogeneous than in Figure 9, there is a slightly greater degree of consensus regarding the positions for the 8-year horizon.

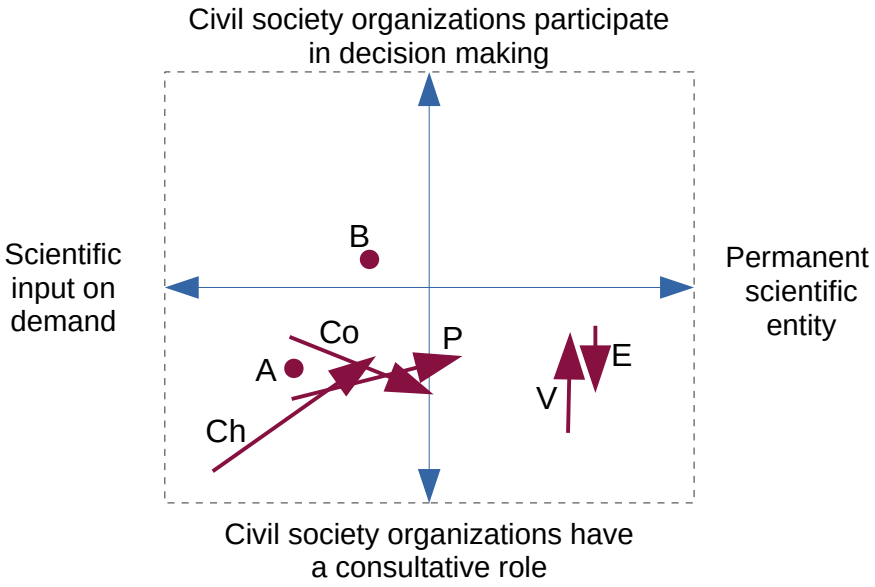

Figure 11: Civil society participation and the role of science, stakeholder goals

In Figure 11, three countries (Chile, Colombia, and Peru) retain the position that CSOs should only have a consultative role and while they wish for a gradual move toward a permanent scientific entity in the longer term, they remain on the side of demand-driven science input. Argentina and Bolivia do not change perspective between the 4-year and 8-year horizon and they both prefer demand-drive scientific input; however, while Argentina prefers CSO's role to be merely consultative, Bolivia has a slight preference for CSO participation in decision making. Finally Ecuador and Venezuela retain a preference for a consultative role of CSOs and a permanent scientific entity, but their perspectives evolve in opposite directions, with Venezuela wishing for a gradual move toward inclusion of CSOs in decision-making and Ecuador seeking rather more exclusion.

=> Center of gravity: the synthesis position for the 8-year horizon shows no preference for a demand-driven or permanent scientific entity but a collective preference to limit CSO's role to that of consultation (about three-tenths from the origin to the edge of the graph)

=> Degree of consensus: the degree of consensus is much greater regarding the role of SCOs than for the nature of a scientific entity.

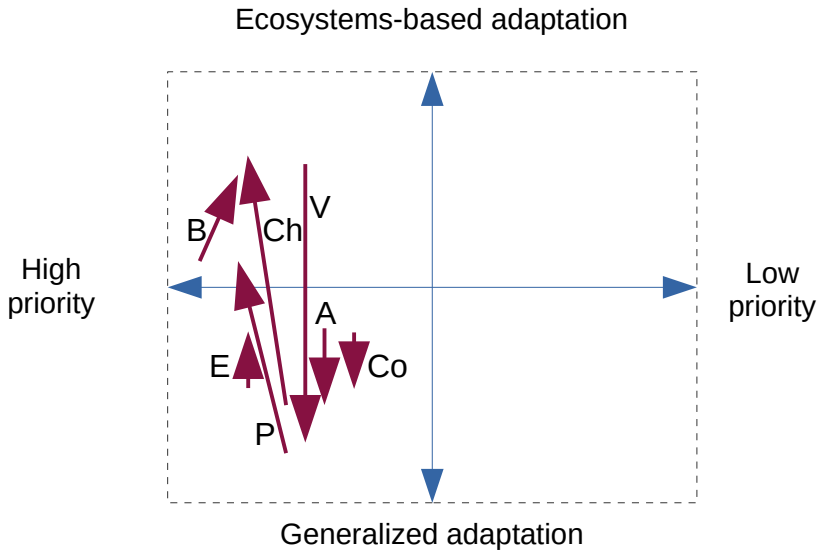

Figure 12: Character and priority of climate change adaptation, stakeholder perspectives

In contrast to the previous three figures, Figure 12 includes only one dimension, generalized versus ecosystems-based adaptation, but assesses the priority given to it. Whereas each of the previous figures included countries that die not change position from the 4-year to the 8-year horizon, all countries feel the need for adaptation to evolve from the medium to the longer term. All countries feel adaptation is a high priority, but whereas four countries (Ecuador, Bolivia, Peru, and Chile, in increasing order of the magnitude of change in perspective) wish to move towards ecosystems-based adaptation, three countries (Colombia, Argentina, and Venezuela, in increasing order of the magnitude of change in perspective) wish to evolve in the opposite direction. What is striking, too, is that while four countries remain on the same side of the spectrum (Argentina, Colombia, and Ecuador on the side of generalized adaptation; Bolivia on the side of ecosystems-based adaptation), three countries change from one side to the other of the spectrum (Chile and Peru from generalized to ecosystems-based adaptation; Venezuela in the opposite direction).

=> Center of gravity: the average perspective is clearly on the side of high priority (approximately three-fifths of the distance between the origin and high priority) but is only slightly on the side of generalized adaptation (one-tenth of the distance between the origin and generalized prioritization.

=> Degree of consensus: Compared with the degrees of consensus on all other issues, the index found for high priority shows the most consensus. At the same time, the degree of consensus on whether adaptation should be ecosystem-based or generalized is the lowest among all issues assessed in Figures 9-12.

A summary of the stakeholder perspectives and degrees of consensus are presented below in Table 4.

Table 4: Summary of stakeholder perspectives, magnitude, and degree of consensus, 8-year horizon

		Degree of consensus[46]		
		low	medium	high
Strength of position[47]	Very low	• Nature of climate change adaptation: Generalized adaptation • Science-policy interface: Permanent scientific entity		
	low		• Locus of cooperation: Open participation by civil society	
	medium	• Character of the governing instrument: Binding instrument • Delimitation: Ecosystems-based delimitation	• Level of cooperation: Multilevel cooperation	• Priority of climate change adaptation: High • CSO role: Consultative role

The summary information suggests that on the basis of stakeholder preferences alone (at least those present at the Ministerial Consultation), the most likely candidates for a longer term scenario are a high focus on climate change adaptation (with a balance of ecosystems-based and traditional approaches) and a consultative role for CSOs, followed by a multilevel cooperation approach, a binding instrument, and an ecoregional delimitation.

6.3 Path dependence and mountain range governance scenarios

6.3.1 Path dependence analysis

While the previous sections have focused on the stakeholder perspectives expressed during the Ministerial consultation, the objective of this step in the analysis is to synthesize experiences from mountain range governance around the world. To this end a pairwise comparison of 4-year and 8-year transition path options is constructed (Figure 13); the method used is inspired by work carried out in the context of interdependence analyses of Sustainable Development Goals and Targets.[48]

The transition path matrix is to be read as follows. The horizontal and vertical axes include the transition path options outlined in Section 6.3.1; however, it is assumed that these options could obtain in the medium *or* the longer term (as is suggested by stakeholder perspectives, where the same options appear in both time horizons). The cells of the matrix

[46] Standard deviation (SD) between 0-0.24: high consensus, SD between 0.25-0.4: medium consensus, SD higher than 0.4: low consensus

[47] 0-5% of distance from the origin: very low , 6%-20% of distance from the origin: low, 21%-79% of distance from the origin: medium, 80%-100% of distance from the origin: high.

[48] See for example Nilsson et al 2016, Weitz et al 2017.

contain an index of the influence of a given medium term option (vertical axis) on the feasibility of other options in the longer term (horizontal axis), where positive numbers represent a re-enforcing impact, negative numbers an impeding impact, and "0" a neutral influence. For instance, opting for a binding instrument (IF1) in the medium term will make it difficult to return to an instrument with a mere declaratory character (IF2) or a programmatic approach (IF3), as the latter would mean the abandonment of the binding instrument.

The numbers at the end of lines and columns represent the sums of the cells. On the *horizontal* axis, they capture the direction and magnitude of influence of a 4-year transition path option on the feasibility of an 8-year transition path option. The highest numbers are linked to the *most influencing 4-year* options. In general, a transition path option with a high row sum can be considered synergistic, facilitating the implementation of other options. A negative row total would suggest that from the perspective of rangewide governance, the given transition path option has an overall impeding influence on the longer term.

On the vertical axis, the column totals represent the *most influenced* 8-year transition path options. Here, high positive numbers suggest a high positive dependency on transition path options chosen in the medium term, i.e. significant dependency on the implementation of many medium-term transition path options. By contrast, low and negative numbers suggest low influence and thus low dependency on the medium-term transition path options.

The cells of the matrix are based on expert assessment derived from evidence in MRG cases and scientific findings from studies of regional governance. Despite this systematic approach, *it is crucial to note that the analysis contains an important degree of subjectivity*. Ideally, this exercise would be carried out with a group of experts and stakeholders.

	8-year horizon transition path																	
4-year horizon transition path		T1	T2	IF1	IF2	IF3	SI1	SI2	VI1	VI2	CSP1	CSP2	SPI1	SPI2	EBA1	EBA2	EBA 3	**Total**
	T1		-1	1	2	-1	1	-1	-1	1	-1	-2	2	2	1	1	-1	**3**
	T2	-2		-2	0	2	1	2	-1	2	-2	2	-2	0	-1	1	-2	**-1**
	IF1	1	2		-2	2	1	-1	2	1	-2	0	2	1	2	1	2	**12**
	IF2	2	1	2		1	1	2	2	1	1	1	1	0	1	0	0	**16**
	IF3	-1	2	0	1		1	2	-1	2	-2	2	1	2	-1	1	-1	**8**
	SI1	1	2	-1	-	1		-1	2	1	-1	1	1	1	-1	1	-2	**5**
	SI2	-2	1	-2	-1	1	0		-1	1	-1	2	-1	0	-1	1	2	**-1**
	VI1	2	1	2	1	1	1	0		-1	0	-1	2	1	2	1	2	**14**
	VI2	0	1	1	0	2	0	2	-1		-2	2	0	1	-1	2	1	**8**
	CSP1	1	0	2	1	0	1	2	1	1		2	1	0	0	1	2	**15**
	CSP2	-1	1	0	0	2	1	2	0	1	1		0	0	0	2	1	**10**
	SPI1	1	2	2	1	1	1	2	1	1	1	1		-1	2	1	1	**17**
	SPI2	2	2	2	1	1	1	1	1	2	0	1	1		1	1	1	**18**
	EBA1	2	1	1	2	1	1	1	2	1	0	1	0	1		1	2	**17**
	EBA2	2	2	0	1	2	1	2	2	2	1	2	1	0	2		1	**21**
	EBA3	2	2	1	1	2	0	1	1	2	0	1	0	1	1	0		**15**
	Total	**10**	**19**	**10**	**8**	**18**	**12**	**16**	**9**	**18**	**-7**	**15**	**9**	**9**	**7**	**15**	**9**	
	T: Territoriality; IF: Institutional formality; SI: Sectoral integration; VI: Vertical integration; CSP: Civil society participation; SPI: Science-policy interface; EBA: Ecosystems-based adaptation 2: strongly re-enforcing, 1: re-enforcing, 0: neutral, -1: impeding, -2: strongly impeding																	

Figure 13: Path dependence matrix of governance transition paths from 4-year to 8-year horizon

Interpretation

The pairwise comparison in Figure 13 reveals a number of findings of importance to the way forward in Andean mountain range governance.

First, it indicates the *most strongly influencing 4-year transition path domains*, i.e. those domains with the highest average row totals, and the *most positively influencing 4-year transition path options per domain* (Table 5).

Table 5: Ranking of 4-year transition path domains and options

Rank	4-year transition path *domain*	4-year transition path *option*
1	EBA: Climate change adaptation	EBA2: Network catalysts
2	SPI: Science-policy interface	SPI2: techno-scientific collective to meet specific data needs
3	CSP: Civil society participation	IF2: Declaratory instrument
4	IF: Institutional formality	CSP1: Agenda setting + policy making
5	VI: Vertical integration	VI1: Strategic regional-national coordination
6	SI: Sectoral integration	SI1: Heterarchy (overlapping, transnational functional domains)
7	T: Territoriality	T1: Ecoregional delimitation

A comparison of the 4-year transition path domains and options shows that the ranking of domains and options is consistent with the exception of a reversal of ranking order for institutional formality and civil society participation. What can be retained from Table 5 is that the first four (underlined) are the most solid options for the *medium term* in a MRG transition scenario.

Second, the matrix identifies the most strongly (positively or negatively) influenced 8-year transition path option domains and options (Table 6).

In contrast to the medium-term domains and options, there is much less line-by-line coherence between the long-term domains and options, although the most influenced or dependent options (underlined) correspond to the top four influenced domains. A comparison of Tables 5 and 6 reveals that only one of the four most influencing domains in the medium term (institutional formality) is also found among the four most "dependent" domains. The most robust options are thus those with a high rank in Table 5 and a high rank in Table 6 if the rank in Table 6 benefits from the chosen medium-term options.

Table 6: Ranking of 8-year transition path domains and options

Rank	8-year transition path *domain*	8-year transition path *option*
1	T: Territoriality	T1: Ecoregional delimitation
2	SI: Sectoral integration	IF3: Programmatic cooperation
3	VI: Vertical integration	VI2: Programmatic regional-national-local
4	IF: Institutional formality	SI2: Polycentricity
5	EBA: Climate change adaptation	CSP2: Project implementation
6	SPI: Science-policy interface	EBA2: Network catalysts
7	CSP: Civil society participation	Equal ranking for SPI1: independent scientific entity and SPI2: techno-scientific collective to meet specific data needs

Tables 5 and 6 reveal clear trends as well as ambiguities in terms of what options lend themselves best for a scenario of moving from medium-term focus to long-term focus. For instance, climate change adaptation emerges as the action domain with the highest potential of positive leverage, with adaptation focusing on network catalysts (task-focused interagency working groups, grassroots initiatives, transboundary networks, public-private partnerships) as the 4-year option with the highest positive leverage. Climate change adaptation does not rank highly in Table 6 which means that it does not depend much on the implementation of other options in the medium term, while still benefiting from demand-oriented scientific input and CSO involvement in agenda setting and policy making – this makes network catalyst focused EBA an excellent candidate for a transition scenario.

On the other hand, an eco-regional delimitation of the governance region ranks lowest among the most influencing 4-year transition path options and is the most highly dependent long-term option; however, an ecoregional approach benefits more than any longer-term options from the most influencing medium-term options,. Making a decision on whether to invest in an ecoregional delimitation both more difficult and less relevant (experience from the Carpathians fully confirms this).

This in turn implies that trade-offs have to be made between a focus on leverage (*active role* as a 4-year transition path option) and sensitivity (*passive role* as a dependent 8-year transition path option) (see Table 7). Furthermore, a decision has to be made whether to focus efforts on strongly influencing 4-year transition path options (synergies) or weakly influencing 4-year transition path options (bottlenecks). This also applies to the longer term, where the trade-off is between strongly and positively influenced transition path options (but high dependency) and weakly influenced transition path options (low dependency). These considerations are taken up in the final section of the analysis.

Table 7: Summary of transition path leverage and dependency

Dependency (contribution from top four medium-term options in parenthesis)		
Low	Medium	High

Synergy potential	Low		• T1: Ecoregional delimitation (7)	• T2: Pluriregionality (4) • SI1: Heterarchy (3) • SI2: Polycentricity (6)
	Medium		• IF1: Binding instrument (6) • VI1: Strategic regional-national vertical integration (6)	• IF3: Programmatic cooperation (4) • VI2: programmatic regional-national-local integration (5) • CSP2: Project implementation (5)
	High	• CSP1: Agenda setting & policy making (1)	• IF2: Declaratory framework instrument (4) • SPI1: Independent scientific collective (2) • SPI2: Demand-driven scientific input (2) • EBA1: Policy catalysts (2) • EBA3: Financial catalysts (4)	• EBA2: Network catalysts (2)

6.4 Mountain range governance scenarios

The transition path options and preferences can now be combined into a set of scenario recommendations for Andean mountain range governance. In order to do this the results of the transition path matrix are placed in the context of the stakeholder perspectives, specifically with regard to option preferences and degree of consensus. This is achieved in the following table.

Table 8: Transition paths comparison

Path dependence matrix	Stakeholder positions from Ministerial consultation	
Most synergistic transition path option per domain (4-year option ranking in parenthesis)	Preferred option (magnitude rank in parenthesis)	Degree of stakeholder consensus
Climate change adaptation		
Network catalysts (1)	Generalized adaptation (4) as a high priority (1)	Very low, High
Science-policy interface		
Demand-driven data provision (2)	Permanent scientific entity (8)	Low
Civil society participation		
Agenda setting + policy making (6)	Open participation by civil society (5) in a consultative role (3)	Medium, High
Governance instrument		
Declaratory character (5)	Binding instrument (2)	Low
Vertical integration		
Strategic regional-national (8)	Multilevel coordination (6)	Medium
Sectoral integration		
Heterarchy (13)	N/A*	N/A*
Territoriality		
Ecoregional (14)	Andes ecoregion (4)	Low

* this particular domain was not addressed as such in the stakeholder consultation.

Table 8 shows that on the basis of the analysis in this report, there are promising venues with regard to some options, while significant efforts will be required for others. On the one hand, both the path dependence matrix and stakeholder preferences point to a key role to be played by climate change adaptation, even if the degree of consensus on whether adaptation should be ecosystems-based or traditional is very low, almost evenly dividing the country delegates to the Ministerial consultation. On the other hand, aside from designating adaptation as a priority, where stakeholder consensus is medium or high, the respective transition path options do not rank very highly (synergistically) in the path dependence matrix, for instance for the role of civil society participation and the nature of vertical integration. Similarly, medium term transition path domains that rank highly in the path dependence matrix, such as the science-policy interface, do not elicit clear positions among stakeholders and/or are subject to a low degree of consensus.

To conclude the analysis, three scenarios are proposed. Each has advantages and disadvantages, which are briefly outlined below. The three scenarios are not comprehensive but include the 4-5 approaches that would require the most attention in the medium term.

An ideal scenario would be one that focuses on those approaches that rank highly in the path dependence matrix and the stakeholder preferences, where stakeholder consensus is high or

medium and where the regional opportunity structure reveals past experience. As the preceding analysis shows, there are some approaches where this is the case but many where it is not. The implication is that no single scenario represents an easy way forward. This should not come as a surprise, as insights from MRG around the world demonstrate. Each and every approach to develop MRG entails intense and lengthy dialogue and negotiations between diverse stakeholders. Another way to look at it, however, is that dialogue may entail participation, knowledge exchange, and trust building, which generally has a positive influence on the sustainability of mountain range governance.

The scenarios outlined below are presented in a cumulative manner: where a particular recommended action reoccurs, reference is made back to the scenario where it is first elaboarated.

Scenario 1: "Robust transition"

This scenario combines those approaches that are relatively present in both international experience and Andean stakeholder preferences.

- *Declaratory framework instrument.* International experience shows that only two MRG arrangements rely on a legally binding instrument (Alpine and Carpathian Conventions) and even these have weak enforcement character. Since they also depend on national policy and European territorial cooperation instruments for funding the implementation provisions, the two framework conventions (and to a lesser degree the sectoral protocols) have largely a declaratory character; programmatic cooperation thus plays an important role (through EU policies in Europe and donor investments elsewhere) it compared to a declaratory instrument its synergistic potential is lower in the medium term and it is more dependent on other approaches in the long term. Andean stakeholders showed a preference for establishing a legally binding instrument in the long term, but the majority feels that a declaratory instrument is preferable in the medium term. As there is regional experience with both options, a MRG transition scenario consisting of progressively more binding provisions (along with the development of regional programs) is the most robust option under this scenario.
- *Network-based climate change adaptation.* It should come as no surprise that climate change adaptation has become a core concern of MRG around the world. Due to the inherent cross-scale and cross-sectoral nature of adaptation interventions, the incorporation of adaptation actions in MRG has taken very different forms (see Section 4.6). These are very often programme or project based, benefiting on the one hand from guidance through UNFCCC-derived national adaptation plans and from funding through GEF and GCF projects. While much adaptation is implemented at the local and national level, where multistakeholder partnerships are almost the norm, some transboundary networks that incorporate voluntary and proactive elements have also emerged. Network-based climate change ecosystems-based adaptation has a high medium-term synergistic potential but also a high long-term dependence on other actions. Climate change adaptation is clearly a priority among Andean stakeholders, but it is also clear that while there is some preference towards a move

to ecosystems-based adaptation, EbA under this scenario will be considered alongside traditional adaptation approaches in the long term. It is worth noting that network-based EbA often involves some degree of experimentation with financial instruments. In the analysis of international experience, these have the same high synergy potential as network-based EbA approaches; their likely long-term benefit from other actions is not as high as that of network-based EbA, but they benefit more from the highest ranking medium-term actions. Paying special attention to financial instruments in network-based EbA is thus a recommended approach under this scenario.

- *Multilevel coordination.* Compared to the first two elements in this scenario, multilevel coordination is both as important as it is difficult to place. On the one hand, MRG experience around the world shows the importance of cooperation between actors at the local, national, and supra- or transnational levels, even if the form this takes varies widely as a function of the political systems of participating countries and the nature of the MRG arrangement. In other words, just because it is important does not mean it is easily implemented or that experiences are exclusively positive. The analysis in this report confirms this, as both variants of vertical integration (strategic regional-national and programmatic regional-national-local) have only a medium potential for synergistic influence in the medium term and a considerable long term dependence on other actions undertaken in the short term, yet benefit highly from the most synergistic medium-term actions. Andean stakeholders place much importance on the role of local government and for this reason have a preference for multilevel coordination. Also, while a majority of stakeholders view multilevel coordination as a desired goal for the longer term, two express a clear preference for national-level (intergovernmental) coordination in the medium term. The strength of this position and the degree of consensus are below average and the evolution of preferences from the medium to the long term show in opposite directions. This suggests that while multilevel coordination is included as a goal in this scenario, it will require considerable negotiating effort to institutionalize it alongside the formalization of the MRG instrument. Looking at the international experience, the consolidation of multilevel coordination will benefit from links to other actions, particularly from climate adaptation activities and programmatic cooperation.
- *Civil society participation.* As is the case for multilevel coordination, CSO participation in MRG must be a core concern in any scenario, but the form this should take vary as widely as it has in the international experience. The reason it is included as a priority element in this scenario is thus not because international experience and Andean stakeholder preferences are the same but because CSO participation in some form plays an important role in both. The analysis of international MRG arrangements shows that CSO participation in agenda setting and policy making has more synergistic potential than the limitation of CSO participation to project implementation in the medium term, yet in the longer term the former benefits much less from other medium-term actions (but is also less dependent on them) than the latter. This would suggest that a gradual move from project implementation to

participation in agenda setting and policy making is an effective way to shape the complementarity under this scenario. Andean stakeholders have a fairly strong consensus in favor of open participation by civil society but also express a preference for limiting CSO participation to a consultative role, albeit with a willingness to towards some inclusion in decision-making. Insofar as this scenario includes a focus on a declaratory, rather than a binding instrument, at least in the medium term, the most effective way to include CSOs in MRG processes is to shape strategic and programmatic consultations in open ways (alongside the promotion of CSOs in project activities).

Scenario 2: "International lessons"

- *Civil society participation.* See "Robust transition scenario" but in this scenario the focus is on agenda setting and policy making, especially in the medium term. One reason for this is that CSO inclusion in decision-making will generate ownership on the part of a key implementation partner, especially at the local level. Another reason is that providing CSOs a say in agenda setting and policy making helps them structure the implementation environment such that they gain access to needed resources and at the same use them more effectively. This is confirmed by the analysis of international experience, where in the long term several medium-term actions have an impeding impact on CSO capacity to participate in agenda setting and policy making. These include a pluriregional approach (because if forces CSOs to spread their resources over multiple MRG processes as compared to a unified ecoregional approach), a binding instrument (because treaties rarely confer decision-making power to nonstate actors), and a programmatic approach to regional-national-local vertical integration (again because it risks spreading CSO resources thinly across multiple action domains).
- *Demand-driven scientific input.* The supporting role of science and expertise is a key concern in international experience, as witnessed by the influential role such scientific bodies as the IPCC or SBSTTA play. The role of scientific entities in MRG varies widely with respect to their formal relationship with a MRG arrangement, the regional conception that shapes the scope of their scientific activities, and the nature of their activities.[49] In the analysis of medium term synergistic potential, an independent scientific entity scores only slightly below a techno-scientific organization meeting data needs on a demand-driven basis. Their overall long-term dependency on other medium-term actions is exactly the same, but they differ with respect to the sources of the dependency. Whereas a techno-scientific organization benefits from a programmatic approach, rather than a single, legally-binding instrument (because the former multiplies data needs as compared to the latter), an independent scientific entity can benefit from an ecoregional delimitation (because it has an identity-building influence as compared to a pluriregional approach). Furthermore, the two alternatives are not mutually exclusive, as an independent scientific entity can also fulfill data needs on a demand-driven basis. The reason why scenario places slightly

[49] Debarbieux et al 2014.

more emphasis on a techno-scientific organization is because it is more likely to be useful to MRG in the long-term; this will depend of course on the degree to which data needs are recognized and acted upon (and that funding is made available) within the MRG, which is why the long term viability of an effective science-policy interface depends on key governance-related factors, not least of which is CSO participation and calls for MRG monitoring and evaluation.

- *Network-based climate change adaptation.* See "Robust transition scenario".
- *Declaratory framework instrument.* See "Robust transition scenario".

Scenario 3: "Andean vision"

- *High priority of adaptation.* See "Robust transition scenario".
- *Consultative CSO role.* See "Robust transition scenario".
- *Multilevel cooperation.* See "Robust transition scenario".
- *Ecosystems-based delimitation.* Analysis of international experience shows that the choice between an ecoregional or some other logic of delimitation is mostly handled pragmatically, that either alternative has very low synergistic potential in the medium term, and that both alternatives are very dependent in the longer term on the implementation of other actions in the medium term. For these reasons, the issue of territoriality does not appear in the "International lessons" scenario; it is also not included in the priority actions of the "Robust scenario". From the perspective of Andean stakeholders, this is an issue that scored average in terms of the clarity of the position and low in terms of consensus, but the reason for this is that one country held a clear outlier position. The striking feature in the analysis of territoriality is that six of the seven countries express a very pronounced preference to move towards an ecoregional delimitation in the long term.
- *Binding instrument.* See "Robust transition scenario".

6.4 Conclusions

Regional mountain range governance has existed in many shapes and forms for several decades. Although the emergence and consolidation of an international mountain agenda has provided common elements – and, importantly, historical markers such as 1992 (UN Conference on Environment and Development) and 2002 (International Year of Mountains) crystallizing local, national, and regional action around the world – mountain range governance has invariably emerged in response to particular needs.

As a result, mountain range governance models, if there is such a thing, are difficult to move in one piece from one context to another. To be sure, landmark texts such as the Alpine Convention have inspired texts elsewhere, but their application has typically followed different logics.

As this report shows, local and national attention to mountains as well as historical experience in regional cooperation in the Andes makes for fertile ground. As the consequences of the climate crisis intensify, recognition of the special vulnerability of, but also of the key resources held in mountains will reinforce the window of opportunity that currently exists for mountain range governance.

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Interviews

The following interviews were carried out by Emilie Dupuits:

- Interview with Sebastian Izquierdo, Binational Coordinator of the PNUD/GEF project, Quito, Ecuador, 13/05/2019.
- Interview with Telma Paredes, Ministerio del Ambiente del Ecuador (MAE), Quito, Ecuador, 23/05/2019.
- Interview with Benjamin Lau, asesor técnico del Consejo Directivo de SERNANP Peru y de la REDPARQUES, via Skype, 20/05/2019.

The following experts were consulted by Anna Scolobig:

- Juliette Martin and Wei Liu (International Institute of Applied Systems Analysis, Vienna, Austria)
- Elena Lopez Gunn (ICATALIST, Madrid, Spain)
- Matthias Buchecker (Eidgenössische Forschungsanstalt WSL Birmensdorf, Switzerland)
- Christian Kuhlicke (Umweltforschungzentrum, Leipzig, Germany)

Annexes

Annex 1: Glossary

Adaptation (1): in human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects. (IPCC 2012)

Incremental adaptation: Adaptation that maintains the essence and integrity of a system or process at a given scale.

Transformational adaptation: Adaptation that changes the fundamental attributes of a socio-ecological system in anticipation of climate change and its impacts. (Park 2012)

Adaptation (2): adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC 2008)

Adaptive capacity: the general ability of institutions, systems, and individuals to adjust to potential damage, to take advantage of opportunities, or to cope with the consequences. (IPBES)

Ecological engineering: the design of sustainable ecosystems that integrate human society with its natural environment for the benefits of both (Mitsch and Jorgensen 2012)

Ecosystem: an ecosystem is a functional unit consisting of living organisms, their non-living environment and the interactions within and between them. The components included in a given ecosystem and its spatial boundaries depend on the purpose for which the ecosystem is defined: in some cases they are relatively sharp, while in others they are diffuse. Ecosystem boundaries can change over time. Ecosystems are nested within other ecosystems and their scale can range from very small to the entire biosphere. In the current era, most ecosystems either contain people as key organisms, or are influenced by the effects of human activities in their environment. (WGI, II, III; IPCC 2014)

Ecosystem-based adaptation (EbA, 1): the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change. Ecosystem-based adaptation uses the range of opportunities for the sustainable management, conservation, and restoration of ecosystems to provide services that enable people to adapt to the impacts of climate change. It aims to maintain and increase the resilience and reduce the vulnerability of ecosystems and people in the face of the adverse effects of climate change. Ecosystem-based adaptation is most appropriately integrated into broader adaptation and development strategies (CBD 2009:41, used also in WGIIAR5).

Ecosystem-based adaptation to climate change (2): the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change (CBD, 2012). It refers to actions that mix the use of biodiversity and ecosystem services policy instruments with socio-economic and development policy instruments to help people adapt to the adverse effects of climate change (Scarano, 2017).

Ecosystem-based disaster risk reduction (1): The concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events (IPBES 2018)

Ecosystem-based disaster risk reduction (Eco-DRR) **(2):** is the sustainable management, conservation, and restoration of ecosystems to reduce disaster risk, with the aim of achieving sustainable and resilient development (Estrella and Saalismaa 2013:30).

Ecosystem approach: A strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use. An ecosystem approach is based on the application of appropriate scientific methods focused on levels of biological organisation, which encompass the essential structure, processes, functions, and interactions among organisms and their environment. It recognises that humans, with their cultural diversity, are an integral component of many ecosystems (CBD, 2004).

Ecosystem services (1): ecological processes or functions having monetary or non-monetary value to individuals or society at large. These are frequently classified as (1) supporting services such as productivity or *biodiversity* maintenance, (2) provisioning services such as food, fiber or fish, (3) regulating services such as *climate* regulation or carbon *sequestration* and (4) cultural services such as tourism or spiritual and aesthetic appreciation. {WGII, III IPCC 2014}

Ecosystem services (2): Benefits people derive from ecosystems (Mooney *et al.* 2004; Millennium Ecosystem Assessment (MEA), 2005). The direct and indirect contributions of ecosystems to human well-being (MEA, 2005). Ecosystem Services are divided into four main categories: provisioning (*e.g.* provision of food, water and raw material); regulating (*e.g.* climate regulation, erosion prevention and water treatment); cultural (*e.g.* recreational and spiritual services); and supporting services (*e.g.* nutrient cycling, primary production) (MEA, 2005).

Ecosystem governance: Ecosystem governance is an approach that merges different disciplines to explore ways that human can protect the environment and maintain activities in a sustainable manner (IUCN, 2019).

Governance frameworks: the norms and rules that govern human communities

Green infrastructure: A strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings (Baró et al., 2016).

Natural capital: Natural capital are natural assets in their role of providing natural resource inputs and environmental services for economic production (OECD, 2005).

Nature-based solutions (1): Actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively,

simultaneously providing human well-being and biodiversity benefits (Cohen-Shacham et al., 2016).

Nature-based solutions (2) are a form of 'eco-innovations' that specifically 'promote nature as a means for providing solutions to climate change (mitigation and adaptation), bad air quality, loss of biodiversity, vulnerable coastlines and other threatened ecosystems, food insecurity and health, social and economic deterioration/injustice (Kabisch et al., 2016, p. 2; Nesshöver et al., 2017, pp. 1216–1217).

Nature-based solutions (3) Nature-based solutions use the natural properties of ecosystems. They have the potential to limit impacts of climate change, enhance biodiversity and improve environmental quality while contributing to economic activities and social well-being. Nature based and nature inspired solutions (NBS) can attenuate ecosystem degradation contributing to genuine improvement in the health, safety and prosperity of mountain communities. These measures can be elegant, effective, frugal and environmentally adapted, providing societies with ecological, social and economic resilience.

Resilience: The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding to or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation (IPCC, 2014).

Social justice: the fair and equitable distribution of the benefits and costs arising from societal processes amongst all groups in society; this includes inter alia issues of equality between genders, and for ethnic, religious and socio-economic groups (Kretsch & Kelemen, 2016).

EbA includes the following measures:

Reduction of synergistic conventional threats: If an ecosystem is stressed both by human activities and climate change, then reducing threats resulting from human activities that add to climate change related threats can improve viability of the ecosystem and hence ensure ecosystem services provision and contribute to EbA. This will be most effective where the conventional and climate change related threats add to produce the same stresses in the ecosystems in question. E.g. where the capacity of a pasture ecosystem to provide biomass is threatened both by overgrazing and less precipitation, reduced stocking and better rotation system could result in stabilized provision of biomass.

Ecosystem restoration to re-establish its functionality and hence ecosystem services provision. Usually only effective if it is likely that threat reduction measures have already sufficiently reduced the direct threats that originally caused the decline in ecosystem functionality. An example might be reforestation.

Engineering to reduce sensitivity: There may sometimes be engineering solutions to gradually reduce dependency of socio-economic activities depending on ecosystem services that are declining because of climate change. Examples are energy-efficient ovens or more effective irrigation systems, drought-resistant crops where climate change results in reduced precipitation or runoff and hence water provision from ecosystem for agriculture, or where

reduced hydrological buffering capacity of ecosystem changes seasonal patterns of water availability.

Small scale relocation: Where climate change results in small-scale spatial shifts of ecosystem service provision (e.g. where vegetation zones with their associated ESS shift horizontally, or in response to reduced water supply), EbA could consist of re-locating ecosystem services dependent economic activities in response. Similarly, where the capacity of ecosystems to protect people and activities against natural hazards is reduced by climate change in one place, measures could include relocating people or activities to where this protection is likely to persist. This type is likely to be more relevant over the long term.

De-coupling: Where climate change reduces ecosystem functionality to such an extent that ecosystem services provision does not support existing economic activities anymore, the only solution from a livelihood and economic development perspective may be to replace these with other economic activities that do not depend on the eroded ecosystem services. An example might be the establishment of greenhouse gardening.

Grey measures, including physical interventions or construction measures that use engineering services, in particular to make buildings and infrastructure resilient to extreme weather.

http://www.grida.no/publications?type=4

https://www.giz.de/expertise/downloads/giz2013-en-ecosystem-based-adaptation.pdf

Annex 2: Complementary Resources

Mountain range governance actors and initiatives

Alliance in the Alps
https://alpenallianz.org/en/about-us

Alpine Convention
http://www.alpconv.org/

Carpathian Convention
http://www.carpathianconvention.org/

Conférence tranjusrassienne
http://www.conference-transjurassienne.org/

Consorcio para el Desarollo Sostenible de la Ecorregión Andina
https://condesan.org/

International Centre for Integrated Mountain Development
http://www.icimod.org/

International Commission for the Protection of the Alps
https://www.cipra.org/en?set_language=en

Mountain Research Initiative
https://www.mountainresearchinitiative.org/

Plan binacional de Desarrollo de la Región Fronteriza Ecuador – Perú
http://planbinacional.gob.ec/gestion-integral-de-la-cuenca-binacional-catamayo-chira/

Pyrenees Climate Change Observatory
https://www.opcc-ctp.org/fr/contenido/accueil

Science for the Carpathians
http://carpathianscience.org/

Scientific Network for the Caucasus Mountain Region
http://caucasus-mt.net/

EbA and NBS related databases

Database of ecosystem-based adaptation solutions
https://panorama.solutions/en/portal/ecosystem-based-adaptation

Interactive bibliography of publications and cases of nature based solutions
http://www.naturebasedsolutionsinitiative.org/publications/

Platform of case studies for nature based solutions
https://platform.think-nature.eu/case-studies

Database of policy documents on Ecosystem services
https://robinne89.wixsite.com/globaldes

Platform of case studies for nature based solutions
https://oppla.eu/case-studies

Atlas of 1000 examples of urban nature based solutions in 100 European cities
https://naturvation.eu/atlas

Annex 3: Case database for Section 4 (Mainstreaming EbA)

Cases in *italics* were chosen for in-depth analysis.

Africa

1. Global ecosystem-based Adaptation in mountain ecosystems programme, Uganda

Asia

2. EbA and eco-tourism, Japan

3. The Himalayan Monitoring and Assessment Programme HIMAP

4. Mahanadi Delta region, India

5. Global ecosystem-based Adaptation in mountain ecosystems programme, Nepal

6. *Sustainable mountain ecosystems management in the High Pamir and Pamir-Alai Mountains, Tajikistan-Kyrgyzstan*

Central America

7. *The Tacaná Watersheds transboundary water governance, Mexico-Guatemala*

Europe

8. *Isar river, Austria-Germany*

9. Mainstreaming EbA in EU policies

10. European cooperation for risk management in transboundary regions, Europe

11. The International Commissions for the Protection of the Rhein and Danube rivers, Europe

Danube Floodplain INTERREG project, Europe

Southern America

12. *Nor Yauyos Cochas Landscape reserve, Peru*

13. Drainage basin of the Uruguay river, Argentina and Uruguay

14. Agroforestry,Peru

15. Climate services, Peru

16. EbA Program, Colombia

Northern America

17. Yellowstone to Yukon Initiative, US-Canada border

18. Disasters as windows of opportunity for financing EbA, USA

Annex 4: AMI Ministerial Consultation, 19-20 November 2018, Quito, Ecuador: Stakeholder consultation methodology

Session "Implementación de la Agenda Estratégica", 15:15 – 16:45

Suggested program and questions for discussion

A. Programme

15h15	Introduction, objectives of the session	UN Environment
15h20	Presentation of UNIGE assessment framework (Sections 2.1., 2.2., 2.3 of the input document) and CONDESAN Andes regional cooperation assessment framework	UN Environment & CONDESAN
15h30	Feedback from participants on assessment frameworks	UN Environment
15h40	Presentation of mountain range governance examples (*selection* from Section 3.2, with clarification from Section 3.1, if necessary)	UN Environment
16h00	Explanation followed by discussion (see below)	UN Environment (with support from Emilie Dupuits)
16h40	Conclusion and next steps	UN Environment & CONDESAN
16h45	End of session	

B. Discussion methodology

The discussion involves a combination of individual reflection, brainstorming, and plenary discussion. Since time is of the essence, the points to be discussed are kept to a minimum. A second round of feedback from participants will be organized after the consultation, possibly by means of a questionnaire and selected interviews.

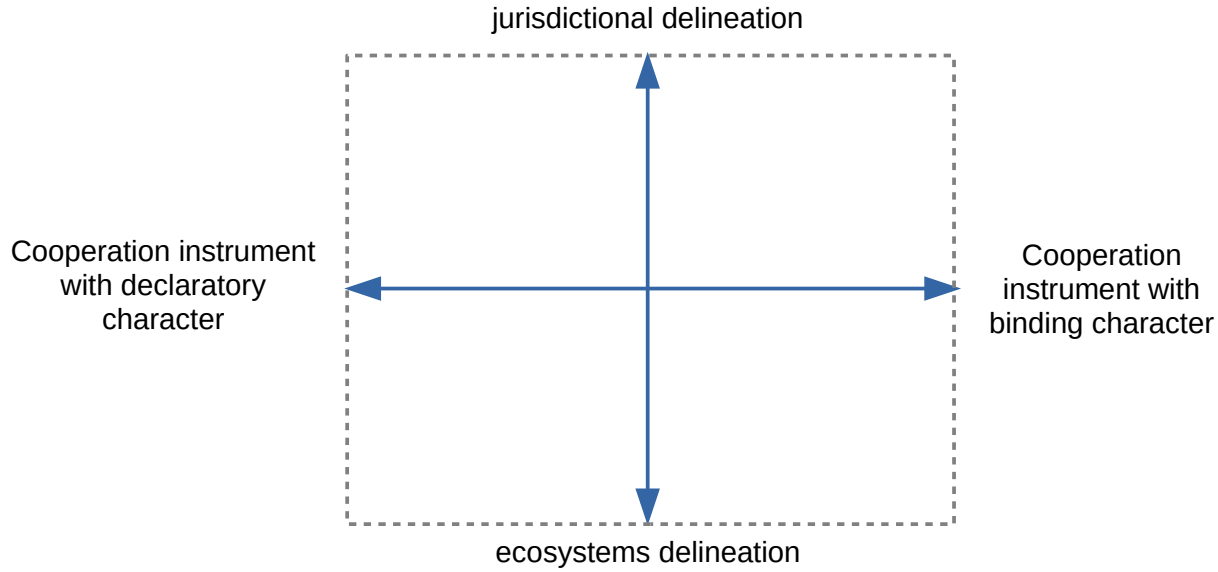
1. Instructions for group discussion – 5 minutes
2. Each participant receives a handout (see annex) and the task to position himself in three scenarios: (i) territoriality & formalization, (ii) thematic priority & climate change, (iii) participation & science – 10 minutes
3. Using post-its or similar, each participant places his approximate position on previously prepared flip charts – 5 minutes (depending on the number of participants)

4. Brainstorming in the plenary on the following questions: (a) "What are distinctive features of regional cooperation in the Andes region?, (b) "How are these features similar or different from other regions?" – 10 minutes
5. The general trends as well as the divergences are identified and commented in plenary – 10 minutes

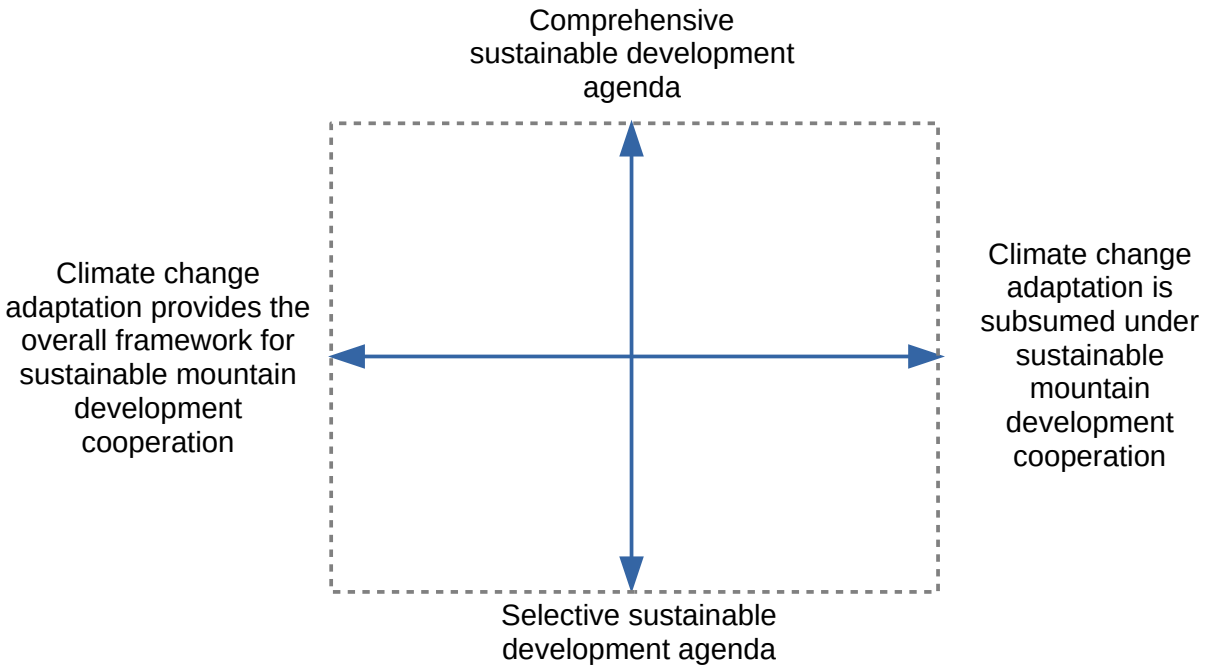
Handout

Instruction: for each of the three scenario matrices: position yourself from the perspective of your institutional role and in response to the following question: Given regional cooperation experiences in Andean countries, and considering examples from mountain regions in other parts of the world, where do you imagine regional mountain cooperation in the Andes could go (mark a square) and where do you think it should go (mark a circle)?

(i) Territoriality and formalization



(ii) Thematic priority and climate change adaptation



(iii) Participation and the role of science