Conservation Standards Applied to Ecosystem-based Adaptation

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Ecosystem-based Adaptation

in High Mountainous Regions of Central Asia

CONSERVATION STANDARDS APPLIED TO ECOSYSTEM-BASED ADAPTATION

Version 1.0

Developed by representatives of

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and

a Climate Adaptation Working Group of the Conservation Measures Partnership

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Conservation Measures Partnership

FOS FOUNDATIONS OF SUCCESS

WWF

CAMPalatoo NGO for sustainable mountain development

CAMPtabiat Public Foundation for sustainable mountain development

About this Document

Conservation Standards Applied to Ecosystem-based Adaptation is a product of collaboration between the Central Asian project team of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH working on Ecosystem-based Adaptation (EbA) and the Climate Guidance Working Group of the Conservation Measures Partnership (CMP). We have worked together to develop this guidance based on an EbA project in Central Asia, but aimed at a global audience of EbA practitioners and the communities with which they work. GIZ has been implementing the EbA project in the high mountainous regions of Central Asia on behalf of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) through the International Climate Initiative (IKI).

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GIZ is a service provider in the field of international cooperation for sustainable development and international education work. GIZ is dedicated to shaping a future worth living around the world and has over 50 years of experience in a wide variety of areas, including economic development and employment promotion, energy and the environment, and peace and security.

CAMP Alatoo is a leading regional Central Asian non-profit and non-governmental organisation that promotes sustainable development in mountain regions of Central Asia. CAMP Alatoo is a successor organisation of the Central Asian Mountain Partnership (CAMP), a programme funded by the Swiss Agency for Development and Cooperation. Jointly with our partner organisations in Kazakhstan and Tajikistan (CAMP Tabiat), CAMP Alatoo forms the CAMP Network.

CMP is a partnership of conservation-oriented NGOs, government agencies, and funders that work collectively to achieve greater impact. CMP developed the Open Standards for the Practice of Conservation to help teams be systematic about planning, implementing, and monitoring their conservation initiatives so they can learn what works, what does not work, and why — and ultimately adapt and improve their efforts.

Foundations of Success (FOS) is a non-profit conservation organization whose mission is to amplify the collective impact of the global conservation community by providing practitioners with the skills and tools needed to be more effective and efficient in their efforts to foster thriving ecosystems, conserve natural resources, and advance human well-being.

WWF is an independent conservation organization, with over 5 million supporters and a global network active in over 100 countries. WWF's mission is to stop the degradation of the Earth's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

EXECUTIVE SUMMARY

This guidance builds on the already widely used Conservation Measures Partnership's Open Standards for the Practice of Conservation (Conservation Standards) to propose a method for designing, implementing and learning from ecosystem-based adaptation (EbA) interventions. The Convention on Biological Diversity (CBD) defines EbA as "the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people adapt to the adverse effects of climate change." (CBD, 2009)

The Conservation Standards, first developed in 2004, represent the leading adaptive management framework in the field of biodiversity conservation and ecosystem management. Thousands of conservation practitioners around the globe have used them to plan, manage, monitor, adapt and learn from their projects and programs. The Conservation Standards provide a user-friendly, evidence-based, and consistent approach that, when applied to EbA, can help your teams (composed of community members and the development and conservation practitioners who assist them) to identify priority ecosystems, assess conventional (non-climate) and climate-related threats, and determine the most appropriate interventions.

Through the application of the Conservation Standards to Ecosystem-based Adaptation (CoSEbA), you develop an understanding of how community livelihoods and well-being depend on ecosystem services. With this understanding, you document observed and likely climate change impacts on the ecosystems providing those essential services. Next, you examine the relationships between climate change and other, conventional threats, identify the socioeconomic factors contributing to the threats, and define adaptation interventions. You then define how you believe that these interventions will address the full range of climate and non-climate threats and contribute to conserving or restoring the ecosystems on which people depend (their "theory of change"). Further, you can use the CoSEbA to determine how to monitor and evaluate progress toward your goals and objectives, to ensure adaptive management and ongoing learning.

Through the adoption of EbA interventions, you can improve communities' natural resource use practices and enhance the health of ecosystems and provision of ecosystem services, while reducing climate vulnerability. New ideas for more efficient and innovative resource use practices and disaster risk mitigation plans can emerge, while community cooperation and relations improve through joint planning and action.

The CoSEbA method consists of thirteen steps:

ASSESS

STEP 1. PRECONDITIONS AND TEAM

Consider enabling conditions for applying CoSEbA, what socio-economic and ecological baseline information you need, and who to include on your planning team.

STEP 2. DEFINE YOUR SCOPE, VISION, TARGETS AND ECOSYSTEM SERVICES

Define the geographic and social scope of your CoSEbA exercise. Once you have identified the rough boundaries and key stakeholders, develop a "vision statement" that summarizes the ultimate conditions that your team is working to achieve. Then define how the communities within your scope depend on local ecosystems and species.

STEP 3. DESCRIBE THE CURRENT STATUS OF ECOSYSTEMS

Document knowledge about the current health of the local ecosystems and species that people depend on.

STEP 4. IDENTIFY CONVENTIONAL THREATS

Identify the current and likely conventional (non-climate) threats to local ecosystems and species.

STEP 5. UNDERSTAND THE VULNERABILITY OF ECOSYSTEMS AND COMMUNITIES TO CLIMATE CHANGE

Understand how the ecosystems that people depend on are vulnerable to climate change. Because the future is often extremely uncertain, we recommend developing two or more scenarios of the future climate and exploring the potential impacts of climate change in each scenario, as well as the relationships between conventional threats and climate impacts for each scenario.

STEP 6. PRIORITIZE THREATS

Now that you have a better understanding of future climate change impacts and their interaction with conventional threats, you are in a position to rate and prioritize the threats, to help you decide which ones to address. We suggest a slightly different rating system for conventional and climate threats.

STEP 7. SUMMARIZE THE SITUATION

After developing models portraying your understanding of the relationships between conventional and climate threats, you add the most important social, cultural, economic, political and financial factors contributing to the conventional threats.

PLAN

STEP 8. RE-EVALUATE PROJECT SCOPE AND TARGETS AND SET GOALS

This step focuses on pausing and reflecting about the original scope of your planning effort and your goals. We recommend asking questions such as: Is the original scope of the effort large enough to account for the function of the key ecosystems and species? Given anticipated climate changes, does it make sense for you to focus on protecting current ecosystems and species, or should you plan for ecosystem transitions, as some species may become locally extirpated and other species that are better adapted to the new climate may move in?

STEP 9. IDENTIFY AND SELECT ADAPTATION INTERVENTIONS

Decide what suite of activities to take to address the threats identified earlier. We suggest ways to use the situation model from Step 7 to consider a wide range of possible options. We also suggest ways to prioritize among possible interventions.

STEP 10. DEVELOP THEORIES OF CHANGE

Develop a "results chain" to document your assumptions about how each intervention will contribute to reducing conventional threats to ecosystems and species and/or providing adaptation options for the community.

IMPLEMENT

STEP 11. IMPLEMENT INTERVENTIONS, MONITOR AND ADAPT

Develop a work plan and budget and undertake the chosen activities.

ANALYZE AND ADAPT

STEP 12. MONITOR AND ADAPT

Monitor periodically, assessing your performance and making necessary adjustments.

SHARE

STEP 13. LEARN & SHARE

Your team can have an impact beyond the scope of your individual projects if you take the time to understand what worked, what did not, and how to improve your project – and then share the results with other communities.

List of Acronyms

CBD	Convention on Biological Diversity
CCNET	Conservation Coaches Network
CMP	Conservation Measures Partnership
CS	The CMP **Open Standards for the Practice of Conservation** or "Conservation Standards" for short
COSEBA	Conservation Standards for Ecosystem-based Adaptation
EBA	Ecosystem-based adaptation (to climate change)
GCM	General circulation model
GDP	Gross domestic product
GHG	Greenhouse gas
GIS	Geographic information system
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
KEA	Key ecological attribute
NGO	Non-governmental organization
RCP	Representative Concentration Pathway
SMART	Specific, measurable, achievable, results-oriented, and time-limited

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INTRODUCTION

Communities that rely heavily on **ecosystems** and biodiversity for their well-being are particularly sensitive to changes in **climate**. Rural people have adapted their lives to regular and predictable changes in seasons, rainfall, snowmelt, and other climate-related factors. Even small changes in climate can cause substantial disruptions in ecosystems, biodiversity, and people's **livelihoods**.

The Convention on Biological Diversity (CBD) defines **Ecosystem-based adaptation** (EbA) as "the use of biodiversity and **ecosystem services** as part of an overall adaptation strategy to help people adapt to the adverse effects of ***climate change***." (CBD, 2009) EbA has received growing attention from development practitioners, policy-makers and donor agencies alike.

While there is general agreement on this definition, the need to operationalize EbA has created a proliferation of tools and frameworks, on-the-ground activities, and research efforts that differ significantly in their understanding of EbA and its intended purpose. An inventory of tools and methodologies relevant for EbA identified more than 220 tools and guidance documents for practitioners (Hicks et al. 2019). Furthermore, the confusion on the meaning of EbA hinders its use, as some organizations still see EbA as the adaptation of ecosystems to climate change rather than the use of ecosystems for human adaptation to climate change (Doswald et al. 2014).

KEY TERMINOLOGY

CLIMATE: The average weather conditions prevailing in an area over the long term (> 30 years).

CLIMATE CHANGE: Long-term changes in climatic parameters in an area over the long term (> 30 years).

ECOSYSTEM: The entirety of the living community (plants, animals, fungi and microorganisms) of an area and its physical environment, including all functional relationships within the community and with the non-living environment.

LIVELIHOOD: The capabilities, assets (both material and social) and activities required for a means of living.

WEATHER: The atmospheric conditions, including temperature, precipitation, and wind at a given place and time.

Besides confusion about the definition and operationalization of EbA, an additional challenge for EbA practice results from the uncertainty that often characterizes climate change – uncertainty about the real effects of climate change, the direct consequences for people and the environment, the degree to which ecosystems can sustain services that humans depend on, and the resulting adaptation or maladaptation decisions people may make. To address all of these challenges, the global EbA community urgently needs a robust framework for planning, management, and monitoring that allows for systematic learning and adaptive management across and within EbA initiatives.

In response to these needs, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH has developed this guidance based on EbA projects in Central Asia, but aimed at a global audience of EbA practitioners and the communities with which they work. EbA planning processes are generally undertaken by communities, with support from development or conservation organizations, government agencies, and other stakeholders. The purpose of this effort is to enable planning teams to develop integrated climate change adaptation interventions that focus on EbA.

This guidance builds on the already widely used CMP Open Standards for the Practice of Conservation[1] (hereafter: the **Conservation Standards**) to propose a method for designing, implementing and learning from climate adaptation **interventions**.

The Conservation Standards represent the leading adaptive management framework in the field of biodiversity conservation and ecosystem management. Since they were first developed in 2004, the Conservation Standards have been used by thousands of conservation practitioners around the globe to plan, manage, monitor, adapt and learn from their projects and programs. They are available in various languages, including English, French, Spanish, Portuguese, Russian, Albanian, Indonesian, Persian and Korean.

The Conservation Standards provide a user-friendly, evidence-based, and consistent approach to the design, management, monitoring, and adaptation of conservation and ecosystem management projects.

1 http://cmp-openstandards.org/

FIGURE 1. CMP CONSERVATION STANDARDS CYCLE VERSION 4.0

The approach enables implementing teams to learn what works, what does not work, and why — and ultimately adapt and improve their efforts. To meet the specific needs of EbA, this CoSEbA guidance proposes revisions to Step 1 (Assess) and Step 2 (Plan) of the Conservation Standards that include identifying those ecosystems on which human communities depend, assessing climate vulnerability, setting climate-smart goals, and considering various types of adaptation interventions. Steps 3-5 of the Conservation Standards (Implement, Analyze & Adapt, and Share) remain the same and are only described briefly in this manual. For more information about the Conservation Standards, see the original Conservation Standards document and additional resources listed in Annex 1.

The CoSEbA method consists of thirteen steps:

- Step 1. Preconditions and Team
- Step 2. Define Your Scope, Vision, Ecosystem Services and Targets
- Step 3. Describe the Current Status of Ecosystems
- STEP 4. Identify Conventional Threats
- STEP 5. Understand the Vulnerability of Ecosystems and Communities to Climate Change
- STEP 6. Prioritize Threats
- STEP 7. Summarize the Situation
- STEP 8. Re-evaluate Project Scope and Targets and Set Goals
- STEP 9. Identify and Select Adaptation Interventions
- STEP 10. Develop Theories of Change
- STEP 11. Implement Interventions
- STEP 12. Monitor and Adapt
- STEP 13. Learn & Share

Through the application of CoSEbA, communities shape an understanding of how their livelihoods and well-being depend on ecosystem services, and document the observed and likely **climate change impacts**. Building on this, they examine the relationships between climate change and other, conventional (non-climate) threats, identify the socio-economic factors contributing to the threats, and define adaptation interventions. They then define their "theory of change" – how they believe that these interventions will address the full range of climate and non-climate threats and lead to their goals to conserve or restore ecosystems on which people depend and maintain or enhance human wellbeing. Further, communities can use CoSEbA to determine how to monitor and evaluate their progress, to ensure adaptive management and ongoing learning.

Through the adoption of EbA interventions, communities can strengthen their natural resource use practices and the health of ecosystems, resulting in improvements in livelihoods as well as reduced **climate vulnerability**. New ideas for more efficient and innovative resource use can emerge, while community cooperation and relations improve through joint planning and action.

This manual describes each of the steps needed to apply the Conservation Standards to EbA projects, but it does not provide detailed instructions on how to facilitate each step. We do not, for example, describe what materials are needed to conduct a threat rating or develop a climate calendar, whether to conduct the exercise using flipchart paper or the Miradi software, how much time it will take, what size group is recommended, or how to document the results. The GIZ EbA project has produced a compilation of training resources for facilitators supporting

KEY TERMINOLOGY

CLIMATE CHANGE IMPACT: A specific impact of a changed climate parameter (e.g. temperature, precipitation, onset of a season) on the viability of a target ecosystem or population. Analogous to a direct (conventional) threat.

CLIMATE VULNERABILITY: The potential of a community or ecosystem to be harmed by climate change. Can be understood as a function of exposure of an ecosystem/community to a climate change related hazard, its sensitivity to it, and its adaptive capacity.

EbA processes, which has been published separately and includes detailed facilitation guidance. In addition, some of the chapters include references to documents that provide more detailed instructions for facilitators. Finally, the Conservation Coaches Network has many resources for "coaches" (facilitators) who are helping conservation teams to apply the Conservation Standards to their project(s).

For additional information and guidance about the Conservation Standards, we recommend using the resources on the Conservation Standards website.[2] A custom-made, affordable software called Miradi[3] supports the application of the Conservation Standards. These resources meet the criteria for tools and approaches appropriate for community-led planning teams, described in Box 1.

2 http://cmp-openstandards.org/resources/

3 www.miradi.org

CRITERIA FOR TOOLS & APPROACHES

BOX 1.

For community-led planning teams to be able to practically tackle climate risks, tools and approaches have to meet important criteria, including:

- *Applicable & adaptable* - fit community-specific contexts
- *Linked* - address links between climate change, ecosystems, ecosystem services, & human well-being
- *Integrated* – address observed & projected climate change impacts with other threats to ecosystems, e.g., unsustainable resource use
- *Tailored* – fit adaptation interventions to the specific situation
- *Useful* – provide a user-friendly and systematic approach to facilitating adaptive management, local learning, and broader knowledge generation

Step 1.
Preconditions and Team

Preconditions for Applying CoSEbA

Before embarking on a CoSEbA planning process, you should evaluate the need, added value, and feasibility of completing the full approach. The involvement and support of community leaders and members, as well as planning facilitators, experts and project staff is crucial. Usually, a small core team leads the EbA planning process. During the pre-planning phase, the team needs to ensure that all necessary resources and capacity for the planning process are in place.

While all communities need to adapt to inevitable changes in climate, ecosystem-based approaches are not always the most effective solutions to address the needs of the entire community and are often used to complement other approaches to adaptation, such as the establishment of gabions for bank protection against flooding, or other purely technical measures. The decision to develop and implement a portfolio of EbA interventions is usually the result of observing climate change vulnerabilities at the local level. However, within a community people are affected by changes in climate in different ways and often have different perceptions of personal and communal vulnerabilities.

Hint: Before planning begins, it is crucial to determine to what extent EbA is useful and feasible, given the needs and capacities of different groups within the community.

To help project teams decide whether an EbA planning process is necessary, feasible and useful in a given situation, we have developed a decision tree based on critical questions (Figure 2). A more detailed version of these questions can be found in Annex 2.

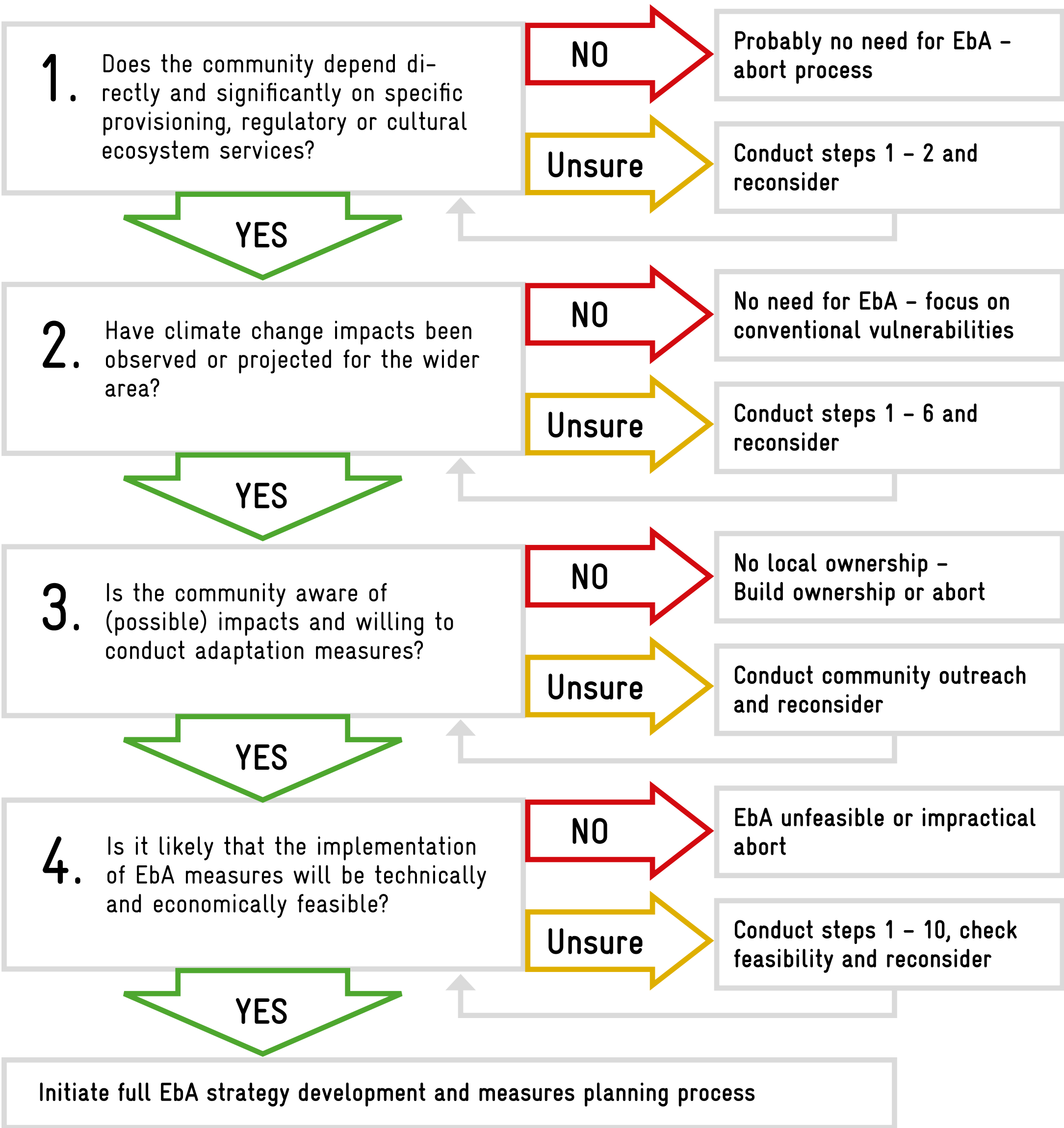
Socio-economic and Ecological Baseline Information

Workshops with community representatives provide most of the necessary socio-economic information for the EbA planning process. However, it is useful to complement local knowledge with information from government statistics, academic research, reports from other projects in the same area, and other sources of information about the area (see Box 2). This baseline information should be as quantitative and geographically explicit as possible.

Who to Include on the Team

EbA planning and implementation requires the involvement of diverse actors, including stakeholders representing the various interests within the

FIGURE 2. DECISION TREE FOR DETERMINING IF AN EBA PROCESS IS NECESSARY, FEASIBLE AND USEFUL



community, external experts, and facilitators. From this larger planning team, a core team is usually formed to lead the process. The **core team** should consist of:

- a few key community leaders,
- (if possible) a climate scientist who can ensure incorporation of available climate projections (who could participate remotely, if necessary), and
- a trained and experienced facilitator, who may be a representative from a local conservation or development project.

The core team may engage additional stakeholders and experts when needed. The skills and knowledge needed on the planning team are illustrated in Figure 3.

BOX 2.

USEFUL BASELINE COMMUNITY INFORMATION

Not all information listed below is needed to initiate an EbA planning process, but more is better:

- Population, number of households, age & gender distribution;
- Community governance, including formal & informal decision-making arrangements;
- Detailed information on each main livelihood activity (e.g. livestock numbers, income generated, ongoing marketing of products);
- Area & distribution of ecosystems, especially those supporting livelihoods or protecting against natural hazards (e.g. map of pastures, agricultural fields, forests, bodies of water, etc.);
- Land ownership & tenure information;
- Known conventional (non-climate) threats to the integrity of livelihood-supporting ecosystems (e.g. unsustainable resource use, conversion to other uses);
- Community dependence on remote sources of income and subsistence (e.g. remittances, remote agricultural areas);
- Type & frequency of observed natural hazards (e.g. landslides, floods, droughts), and their impacts on the community;
- Ecological linkages of production ecosystems to other ecosystems (e.g. hydrological linkages, pollination);
- Soils and vegetation, including vertical vegetation belts;
- General description of historic climate, including trends in monthly & seasonal temperatures, precipitation and seasonality (wet season, dry season, periods of increased storm activity, etc.);
- Local climate change **projections** (see Annex 2 for more detail)

FIGURE 3. ILLUSTRATION OF NECESSARY SKILLS AND KNOWLEDGE NEEDED ON THE PLANNING TEAM

WHO SHOULD BE INVOLVED?

Facilitators

Who: people trained in planning method

Role: guide the planning process

Community leaders

Who: those who make and influence decisions in the community

Role: first points of contact for planning, assist in consensus building

Community members

Who: local people representing various stakeholder interests

Role: provide key inputs for planning, help shape outcomes

Core team

Who: professionals who manage and oversee the project from planning through implementation

Role: Liaison between facilitator, external experts, and communities, gather needed information, plan workshops

External experts

Who: climate scientists, ecologists, social scientists, government leaders

Role: provide needed technical information before planning, serve as resource people during planning process

Step 2. Define Your Scope, Vision, Ecosystem Services and Targets

Define Project Scope

It is important to clearly define the boundaries of your project area. For an EbA project, the "scope" of the project will be both social and geographic. The physical boundaries will depend on the social group for which you are doing the planning and the areas on which that group's well-being depends. The scope broadly encompasses both the ecosystems and ecosystem services that you must consider to ensure climate change adaptation of your partner community.

The initial scope of an EbA planning process will, in most cases, encompass all of the ecosystems that provide ecosystem services to the communities. It is easier to narrow down the scope if you have an understanding of the priority ecosystems based on the services they deliver and/or the likeliness they will be affected by climate change in the foreseeable future. For EbA projects, scoping is a highly iterative process. We recommend defining an initial scope, then identifying ecosystem services and targets, and using that information to refine the scope.

How to Define Your Project Scope

The first step of scoping is to determine the rough geographic boundary of the community or social group for which you are planning. We define the geographic scope of the project as the sum of all ecosystems critical to sustaining the livelihoods and wellbeing of the community. Through interviews with community members, start the process by documenting the areas used by the community. You can use **ecological drawings** (Figure 4) and maps to outline the rough boundaries of the project scope and describe the ecosystems that provide water, food, fuelwood and other resources used by the communities, as well as regulatory services such as flood protection, and cultural services such as sacred areas or recreation areas.

Hint: It is critical to identify all of the areas that the community uses directly, or that indirectly contribute to their wellbeing, in all seasons. For example, water may be collected by the community at one downstream location, but the larger watershed that provides and cleanses that water is also important.

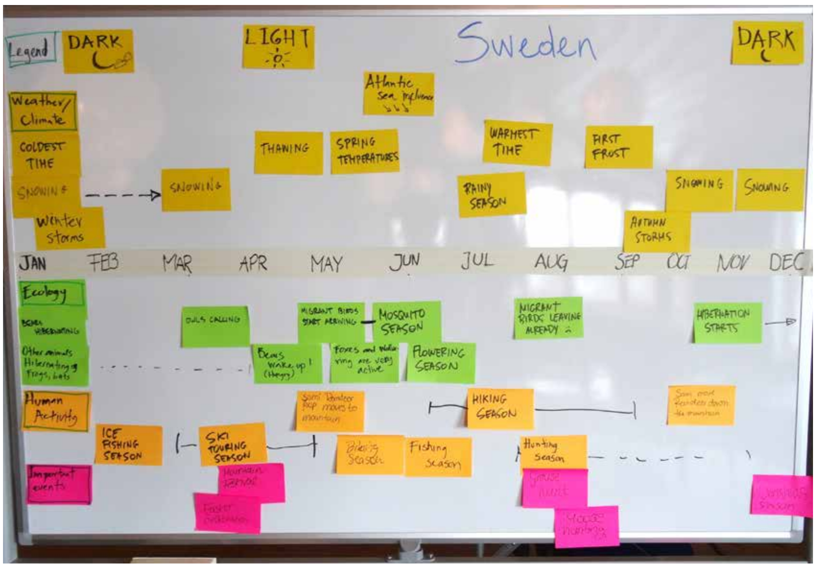
KEY TERMINOLOGY

ECOLOGICAL DRAWING: Ecological drawing: a drawing of the project scope and it includes the communities and ecosystems (forests, rivers, grasslands, etc.) that provide resources for community members.

SEASONAL CALENDAR: A tool for describing the seasons in the project area, ecological events at specific times of the year, natural resource management activities, and important cultural events.

FIGURE 4. ECOLOGICAL DRAWING OF A MOUNTAIN VILLAGE IN CENTRAL ASIA

FIGURE 5. EXAMPLE FROM SWEDEN OF A SEASONAL CALENDAR USED TO SUPPORT SCOPING



(photograph by John Morrison)

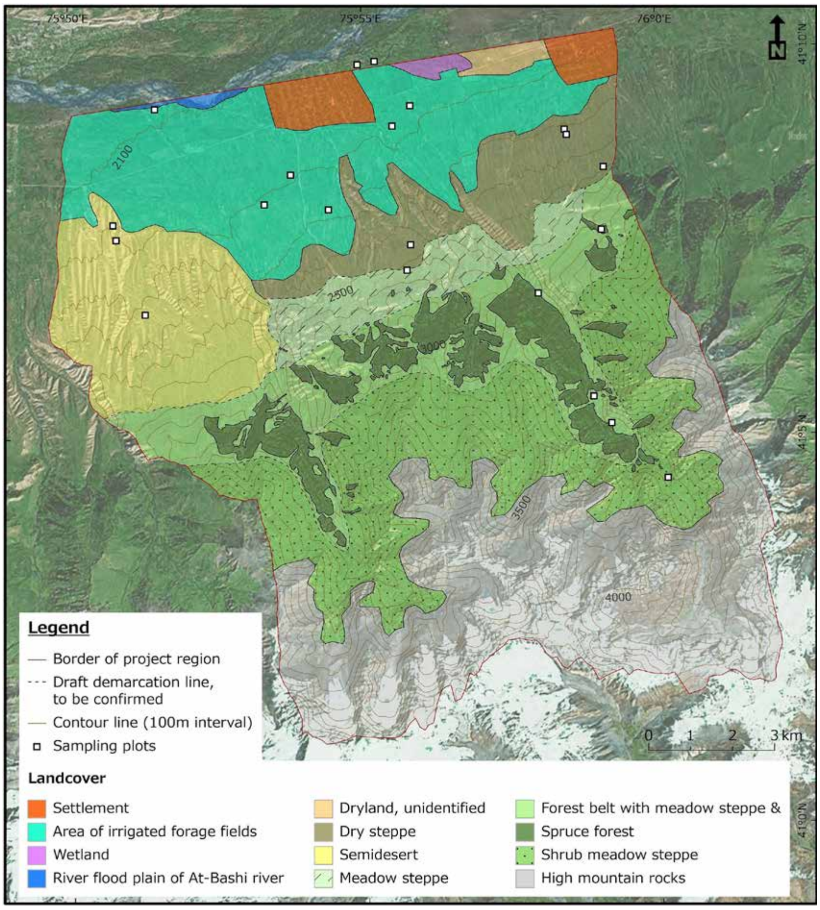
Small adjustments may be necessary to capture the real extent of ecosystems the community depends on. Consider the full extent of grazing areas, areas used for non-timber forest product collection, upstream watersheds that provide clean water, and forests protecting against avalanches and landslides. Do not be surprised if this step results in a patchy or discontinuous scope consisting of several separate areas and includes ecosystems that are not immediately bordering the community. Field visits may help to define the geographic scope and topographic maps and GIS systems may be helpful to document it.

Developing a **seasonal calendar** can help you to understand how communities depend on natural resources. A seasonal calendar is a simple tool for describing the seasons in the project area, ecological events tied to specific times during the year (e.g., flowering or fruiting of vegetation, migration, species reproduction, etc.), natural resource management activities (e.g., harvesting, hunting, etc.), and important cultural events (e.g., when school begins and ends, festivals, holidays, etc.). An example from Sweden is shown above in Figure 5.

Example of a Project Scope

As shown in Figure 6, it is very helpful to develop a map of your project scope and ecosystem targets. In this example, the project scope (outlined in red) includes two communities and the forests, meadows, irrigated fields, wetlands, and other areas they depend on for natural resources.

FIGURE 6. MAP OF A PROJECT SCOPE AND ECOSYSTEM TARGETS FOR BASH KAIYNDY, KYRGYZSTAN



(Source: Michael Succow Foundation)

Define Project Vision

A **vision statement** is a description of the desired general state or ultimate condition that a project is working to achieve. A vision statement is not mandatory, but many projects find it very useful to forge a common position on the overall goal of the project. An EbA project vision statement would commonly include references to the resilience of the human community in the face of climate change (or change in general), and the ecosystems, wild species, and natural processes that support the community.

How to Define Your Project Vision

Wordsmithing a project vision with a large group of people can be tedious. An alternative is to collect key phrases that participants think are important to include and then task a volunteer or small working group to integrate the input, eventually presenting their work back to the group. It may take a few iterations until everyone is satisfied.

Example of a Project Vision

The community of Voru (Penjikent, Tajikistan) continues to exist and prosper, and its inhabitants continue to support their livelihoods and wellbeing through sustainable agriculture and animal husbandry in the areas around the village, in spite of the impacts of climate change. The ecosystems on which the community depends for resources, security and its cultural and spiritual life may have shifted or changed to a certain extent, but are fundamentally intact because of sustainable, climate-smart management.

BOX 3.

CRITERIA FOR A GOOD VISION STATEMENT

- *Relatively general* - roadly defined to encompass all project objectives
- *Inspirational* - ambitious in describing the desired change that the project is working towards
- *Brief* - Simple and succinct so that all project participants can remember it

Step 2.

Define Ecosystem Services and Related Ecosystem Targets and Human Well-being Targets

Recall the purpose of EbA: to ensure that ecosystems (and related species) within the scope will support human adaptation to climate change into the future. To do that, you need to understand the relationship between people and ecosystems. Thus, we need to identify ecosystem services, the ecosystems that provide them, and what aspects of human well-being these ecosystem services are supporting in the project area.

Ecosystem Services

Ecosystem services are the benefits people derive from ecosystems (Millennium Ecosystem Assessment[4]). Ecosystem services are important for EbA: On the one hand, the provision of ecosystem services can be affected by climate change, which may lead to a need for adaptation. On the other hand, some ecosystem services, if protected, can contribute to ecosystem-based adaptation, e.g. by buffering against the impacts of more frequent extreme weather events, temperature extremes, sea-level rise and other expected changes in climate. The very

4 https://www.millenniumassessment.org/en/index.html

EXAMPLES OF TYPES OF ECOSYSTEM SERVICES

BOX 4.

Type of Ecosystem Service	Examples
Provisioning services	■ human wild foods, spices and medicinal plants ■ raw materials (including lumber, skins, fodder, and fertilizer) ■ genetic resources (including crop improvement genes, and health care) ■ water ■ energy (fuel wood, hydropower, biomass fuels) ■ ornamental resources (including jewelry, pets, decoration and souvenirs)
Regulating services	■ carbon sequestration and climate regulation ■ flood control ■ slope stabilization ■ waste decomposition and detoxification ■ purification of water and air ■ pest and disease control
Cultural services	■ symbolic (including use in books, film, painting, folklore, national symbols, etc.) ■ spiritual and historical (including use of nature for religious or heritage value) ■ recreational experiences (including ecotourism, outdoor sports, and recreation) ■ science and education (including for school excursions, and scientific discovery)
Supporting services	■ nutrient recycling ■ primary production (e.g., phytoplankton, algae) ■ soil formation ■ habitat provision, and pollination

idea of EbA is to manage ecosystems in such a way that provision of these services is supported.

Although classifications vary and are not critical for our purposes, there are four commonly referenced categories of ecosystem services: supporting services, provisioning services, regulating services, and cultural services. Box 4 has examples of each category.

Ecosystem Targets

For our purposes, an **ecosystem target** is an ecological system or a species on which the community depends for ecosystem services. An ecosystem is defined as the entirety of the living community (plants, animals, fungi and microorganisms) of an area and its physical environment, including all functional relationships within the community and with the non-living environment. Examples of ecosystems (and their associated species) that provide ecosystem services to communities include forests (and even more specific forest types, with associated timber and non-timber forest products), grasslands, rivers (and associated fish), wetlands (and associated waterfowl), coral reefs, mangroves, and beaches. Ecosystem targets should also include not only natural ecosystems but also managed ecosystems, such as orchards and pastures. In short, we are looking to identify whatever natural or managed systems people depend on.

Human Well-Being Targets

Human well-being targets are defined as those aspects of human well-being affected by the status of ecosystem targets. The Millenium Ecosystem Assessment[5] outlines five dimensions of human well-being:

- Necessary material for a good life: including secure and adequate livelihoods, income and assets, enough food at all times, shelter, furniture, clothing, and access to goods;
- Health: including being strong, feeling well, and having a healthy physical environment;
- Good social relations: including social cohesion, mutual respect, good gender and family relations, and the ability to help others and provide for children;
- Security: including secure access to natural and other resources, safety of person and possessions, and living in a predictable and controllable environment with security from natural and human-made disasters; and
- Freedom and choice: including having control over what happens and being able to achieve what a person values doing or being.

EbA project teams should identify all of the aspects of human well-being that are important to the community and depend upon an ecosystem and associated ecosystem services in the project area. Necessary material for a good life and health are usually tied to ecosystems through provisioning ecosystem services.

KEY TERMINOLOGY

ECOSYSTEM SERVICE: Services that intact, functioning ecosystems, species, and habitats provide and that can benefit people.

ECOSYSTEM TARGET: An ecological system or species on which the community depends for ecosystem services.

HUMAN WELL-BEING TARGET: Human well-being targets focus on those components of human well-being affected by the status of ecosystem targets.

Health and security from natural disasters frequently depend on regulating services, such as water and air purification, soil stabilization and flood control.

Hint: The team may also want to include some human well-being targets that do not depend on ecosystem services but are important to the community. Good social relations and freedom and choice, for example, generally do not depend on natural ecosystems.

The objective in this step is to be able to visualize the importance of and linkages between ecosystems, ecosystem services, and human well-being. More guidance about these linkages is available in CMP's document on Incorporating Social Aspects and Human Wellbeing in Biodiversity Conservation Projects.

How to Define Ecosystem Services, Related Ecosystem Targets and Human Well-being Targets

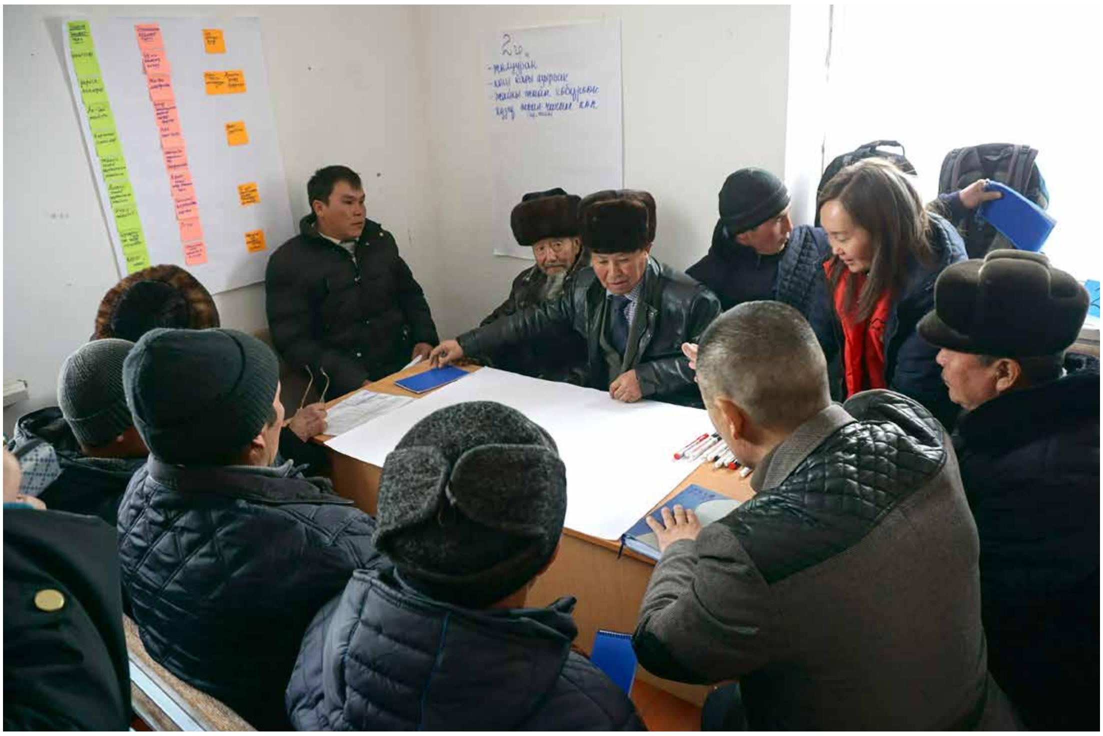
1. Identify Ecosystem Services and Related Human Well-being Targets

The aim of this step is to identify a small set of ecosystem services that humans obtain from the ecosystems around them and the elements of human well-being that are dependent on the ecosystem services. Review the list of ecosystem services in Box 4 and consider which ones are relevant for your area. The more specific the identified ecosystem services, the better, within reason. The analysis should focus on ecosystem services relevant at the local level, rather than global ecosystem services that the project cannot effectively address.

Because you will be drawing linkages from the ecosystem targets to ecosystem services and then to the human well-being targets, we recommend

5 https://www.millenniumassessment.org/en/index.html

FIGURE 7. A TEAM IN BASH KAIYNDY, KYRGYZSTAN DISCUSSING TARGETS AND ECOSYSTEM SERVICES



(photograph by John Morrison)

using flipchart paper and Post-it notes and cards to complete this step (see Figure 7).

In our example project, alpine and subalpine grasslands provide wild plants (medicinal plants, berries, etc.), forage for livestock, and wildlife hunted for fur and trophies. These ecosystem services contribute to income and employment, physical and mental health, nutrition and food security, and housing and comfort (see Figure 8).

Hint: Remind participants to think not only of provisioning ecosystem services that provide marketable resources, but also of the other categories of ecosystem services, including regulating services – e.g., slope stabilization due to a forest.

2. Identify the Ecosystems that Provide Each Ecosystem Service

For each ecosystem service, identify the ecosystems that provide it (e.g., water comes from streams and rivers, fuelwood is from juniper forests, etc.). This will allow you to list all of the ecosystems that the community depends on. As an input into this discussion, the core team can develop an initial list of ecosystems, based on a review of documents and/or interviews with community members and then refine this list in a workshop setting or develop the draft list with the group during a workshop.

In a workshop setting, developing an ecological drawing and a seasonal calendar can help in the identification of possible ecosystem targets. As shown earlier in this chapter in Figure 4, an ecological drawing is a drawing of the project scope and it includes the communities and ecosystems (forests, rivers, grasslands, etc.) that provide resources for community members. The seasonal calendar provides information about how humans depend on ecosystems for their well-being (see Figure 5).

Hint: When identifying ecosystem targets, consider both natural ecosystems (e.g., forests, wetlands) and managed ecosystems (e.g., kitchen gardens), which also provide important ecosystem services.

3. Lump, Split and Select Your Ecosystem Targets

We recommend limiting the number of ecosystem targets to no more than eight or ten. This is because it is hard for a team to focus on managing more than this number of ecosystems. If your draft list of targets is more than this, then consider lumping associated ecosystems that face similar threats and may require similar conservation interventions, such as rivers and freshwater wetlands.

If specific species are important to the community and face threats not associated with habitat destruction or degradation, such as unsustainable hunting or fishing, you should consider including these species (or group of species) as a target. Potential examples of such species in Central Asia include Saiga antelope, Argali, Snow leopard and various sturgeon species.

In our example project from Central Asia, the team identified the following ecosystem targets: upstream glaciers, streams, riparian forest and bushland, Juniper forest, alpine and subalpine grasslands, autumn and spring pasture, and irrigated orchards. You may note that most of these are natural ecosystems, while some are agricultural or grazing areas on which the communities depend.

4. Develop a Map of the Ecosystem Targets

It is helpful to develop a map of the scope and ecosystem targets that the team chooses to focus on (see example in Figure 6, above). You can either draw a map by hand, develop a simple Google map, or use GIS software. Either way, the product will help clarify the ecosystem targets and project scope.

Be sure to use existing ecosystem or vegetation maps as a reference. They can help you define the natural ecosystems represented in the areas that the community depends on.

5. Use Targets and Ecosystem Services to Refine Your Project Scope

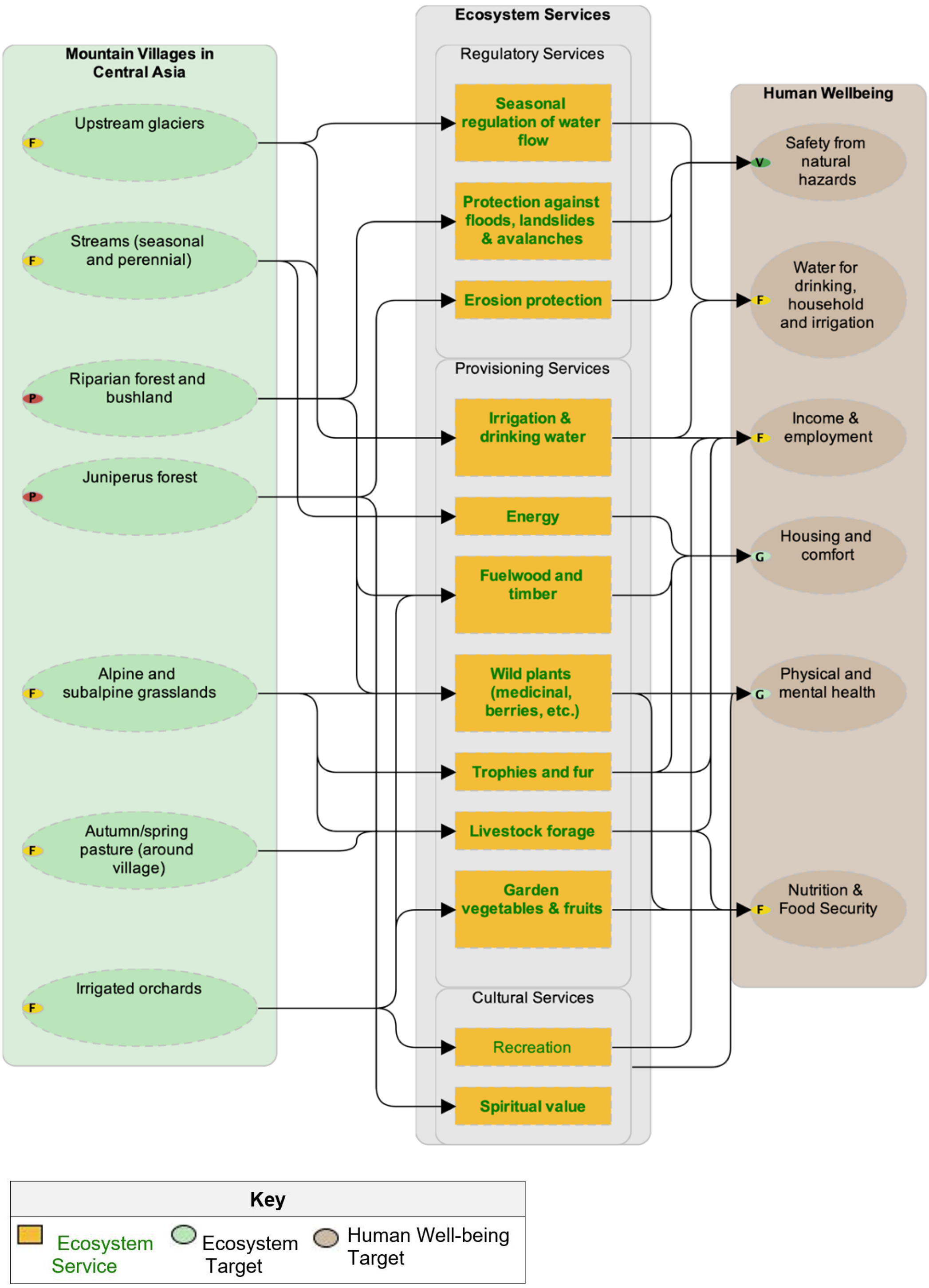
Use your ecosystem targets and ecosystem services to refine the geographic scope of the project. Frequently, this step enables the community to recognize the need to include areas that indirectly contribute to their well-being, such as upper watershed areas that provide water during dry periods.

6. Document Your Work

Once the planning team has defined the ecosystem targets, ecosystem services and human well-being targets, the Core Team will need to digest this information, make any necessary refinements, and then develop a simple box-and-arrow diagram that explicitly links these elements. We recommend using the Miradi software to document your work. Figure 8 was produced using Miradi. See Annex 1 for more information about Miradi.

Example of Ecosystem Targets, Ecosystem Services and Human Well-being Targets

FIGURE 8. EXAMPLE ECOSYSTEM TARGETS, ECOSYSTEM SERVICES AND HUMAN WELL-BEING TARGETS



Step 3. Describe the Current Status of Ecosystems

Define Ecosystem Status

To design effective interventions, you must know the current status, or 'health,' of your ecosystem targets. This step is referred to as the **viability** assessment in the Conservation Standards. You need to understand each ecosystem target's capacity to provide ecosystem services, in the face of both **conventional threats** and climate change impacts. **Key ecological attributes** (KEAs) are aspects of an ecosystem's ecology that, if present, define a healthy ecosystem and, if missing or altered, would lead to the loss or degradation of that ecosystem. For example, a KEA of a montane forest could be the age structure of the forest - if the forest includes primarily one age class (older trees) and little regeneration, this is an indication of an unhealthy forest that will not be able to provide forest products over time. For EbA, the KEAs will often reflect the ecosystem's capacity to deliver services to surrounding communities. Defining KEAs helps teams to describe the current status of the ecosystem[6].

KEY TERMINOLOGY

VIABILITY: The structural and functional intactness or ecological health of a target ecosystem or population, which determines its resilience and resistance to external perturbations and its likelihood of persistence in the future.

CONVENTIONAL THREAT: A human activity that directly and negatively affects the viability of an ecosystem. CoSEbA uses the term "conventional" to designate those threats that are not related to climate change.

How to Define Ecosystem Status

1. For Each Ecosystem, Define a Small Set of KEAs

There are numerous attributes that could describe your target. The challenge during this step is to identify a small number of **key** attributes that, if degraded, would jeopardize the ecosystem's ability to persist and to provide ecosystem services. Because teams often have limited capacity for monitoring, you should focus your KEAs on the most indicative components of the ecosystem's health, or those that speak most directly to the desired ecosystem service(s). For further discussion and classification of KEAs, see Schick et al. (2019).

There are three types of KEAs – size, condition, and landscape context (see Table 1). Generally, one or several size and/or condition KEAs are necessary. The capacity of ecosystems to provide ecosystem services to the community is often an important condition. Some ecosystems, such as fire-depend-

6 The guidance provided in this chapter draws heavily from Conceptualizing and Planning Conservation Projects and Programs (FOS 2009). For more detailed guidance, please see the chapter on viability assessment in Step 1B (Week 4) of that manual.

ent forests and floodplain forests are particularly dependent on ecological processes that should be captured as landscape context KEAs (fire regime, hydrologic regime, etc.).

2. Select Indicators to Monitor Changes in These KEAs

You will need to measure the indicator for each KEA regularly to determine if the current ecosystem status is improving over time or declining, despite the project team's efforts. In some cases, the indicator can be the same as the attribute itself (e.g., an attribute of 'area of forest' may have an indicator of 'number of hectares of forest'). In such cases, you can measure a KEA using just a single indicator.

However, some KEAs may be too complex to measure with a single indicator. For example, if your attribute is the water quality of a stream, there are multiple physical and chemical parameters contributing to this but it is not possible to measure them all. Instead, you would select a few representative parameters (e.g., water temperature and dissolved oxygen levels) that can represent the overall water quality.

Indicators are often quantitative – e.g., number of hectares, recruitment rate, age class sizes, percent forest cover, or frequency of fire of a given intensity. Other indicators may be qualitative, such as whether fire occurs frequently enough to meet the ecological needs of a grassland ecosystem.

3. Define an Acceptable Range of Variation and Rating Scale for Each Indicator

Most attributes vary naturally over time, but we can define an acceptable range of variation (Box 6). This is the range of variation for each KEA indicator that would allow the ecosystem to persist over time

TABLE 1. TYPES OF KEY ECOLOGICAL ATTRIBUTES WITH EXAMPLES

Type	Definition	Examples
Size	Measure of the area of an ecosystem or abundance of a species	Area of a forest in hectares Number of mature individuals in a population of a target species.
Condition	Measure of the intactness of the ecosystem.	Capacity of an upland forest to absorb rainfall, regulate streamflow and prevent flooding Water quantity or quality in a river Species composition (as a measure of whether the ecosystem has been significantly altered)
Landscape context	Measure of the ecosystem target's health in the context of the larger landscape, including ecological processes (e.g., flooding, fire regime) and the connectivity with other ecosystems that allows species and natural communities to respond to environmental change.	Natural river flow regime (timing and amount of streamflow) Proximity of similar ecosystems into which key species could migrate or disperse.

CRITERIA FOR GOOD INDICATORS

BOX 5.

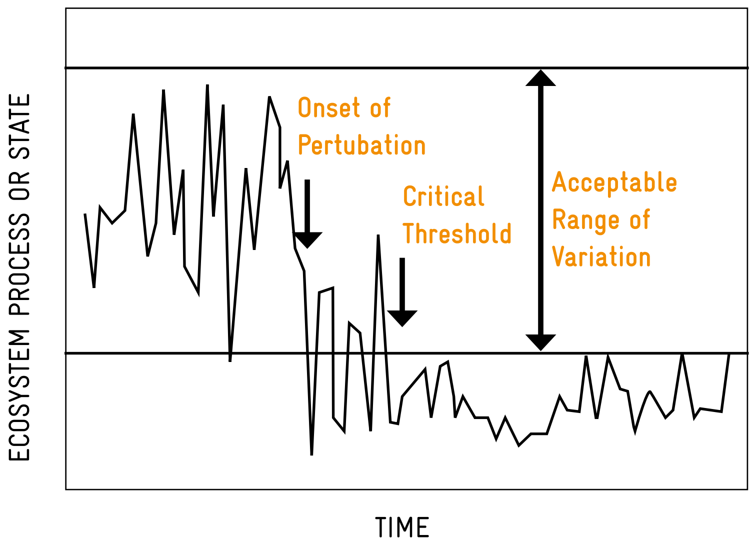
- *Measurable* - Can be recorded and analyzed in quantitative or qualitative terms
- *Precise* - Defined the same way by all people
- *Consistent* - Not changing over time so that it always measures the same thing
- *Sensitive* - Changes proportionately in response to the actual changes in the condition being measured
- *Relevant* - Technically and financially feasible to monitor and of interest to partners, donors, and other stakeholders

– a range in which we would say the attribute has very good or good status (see Box 7 for definitions of these criteria). If the attribute is outside of this acceptable range (i.e. in Fair or Poor status), then the ecosystem is degraded. The challenge is to use current knowledge to define an acceptable range of variation. It is often helpful to involve scientists in this step, to ensure that your categories are based on the best available information.

USING ACCEPTABLE RANGE OF VARIATION FOR DECISION MAKING

BOX 6.

Most key ecological attributes will vary over time. For example, the size of a migratory fish population might go up and down on a year-to-year basis. As shown below, however, there is a difference between a population size that is within the acceptable range of variation and one that is under exceptional stress and thus falls outside this acceptable range.



CRITERIA FOR DEFINING QUALITATIVE RATINGS FOR INDICATORS

BOX 7.

- *Poor* - Restoration is increasingly difficult; may result in the complete termination of the ecosystem service
- *Fair* – Outside of the acceptable range of variation; requires intervention to provide the necessary ecosystem services
- *Good* – Within the acceptable range of variation; some intervention may be required to maintain the necessary level of ecosystem services
- *Very Good* – Ecologically desirable status; requires little or no intervention to maintain ecosystem services at the desired level

The ratings may be more or less precise, depending on the level of background information that your team has. If you have little information on the acceptable range of variation within the ecosystem, you may not have specific quantitative definitions for poor, fair, good, or very good. Instead, you can qualitatively describe important thresholds like the one between fair and good. For example, in a riparian forest (see Table 2), *good* = the presence of sufficient desirable vegetation, and *fair* = the lack of sufficient desirable vegetation. As your team becomes more familiar with the ecosystem through research or monitoring, you can refine these thresholds.

4. Determine the current status of the ecosystem target

As seen in Table 3, you can use this same rating system to indicate the current status of the ecosystem. If you do not have baseline data, you may need to make an informed estimate about the ecosystem's current status.

5. Repeat steps 1 - 5 for the other ecosystem targets

In subsequent steps, you can use this rating system to define the desired future status of the ecosystem. As climate change can have unpredictable impacts, you should consider a variety of climate scenarios before determining a desired future status. In the next steps, we will describe how to conduct a climate vulnerability analysis that will help your team define the desired – and achievable – future status of your ecosystem targets.

KEY TERMINOLOGY

SCENARIO (CLIMATE): A complex, multi-parameter description of a possible climate at a defined moment in the future. Can be expressed in terms of a relative change to the current climate.

TABLE 2. EXAMPLE OF QUANTITATIVE AND QUALITATIVE RATING SCALES

			Indicator ratings			
Ecosystem target	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**
Example of quantitative rating						
Riparian forest	Area of riparian forest	% of the area within 50 meters of the river that is forested	< 25%	25-50%	51-75%	> 75%
Example of qualitative rating						
Riparian forest	Area of riparian forest	forest cover along the river		Substantial parts not forested	Most parts moderately to well forested	

TABLE 3. EXAMPLE OF CURRENT LEVEL OF VIABILITY

			Indicator ratings			
Ecosystem target	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**
Floodplain forest	Area of floodplain forest	% of the area within 50 meters of the river that is forested	< 25%	25-50%	51-75%	> 75%
Current rating				X		

Example of an Ecosystem Status Assessment

Below is an additional example for an ecosystem status assessment, in this case for alpine and subalpine grasslands (see Table 4). This assessment builds on an existing and widely used, composite, semi-quantitative index of pasture degradation (Etzold & Neudert 2013). This index takes into account vegetation coverage, erosion tracks, species composition and richness, as well as other factors.

TABLE 4. EXAMPLE OF AN ECOSYSTEM STATUS ASSESSMENT FOR ALPINE AND SUBALPINE GRASSLANDS

			Indicator ratings			
Ecosystem target	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**
Alpine and subalpine grasslands	General grassland condition	Pasture degradation index of Etzold & Neudert (2013)	< 33	34-67%	68-84%	> 84%
Current rating				X		

Step 4. Identify Conventional Threats

Climate change does not affect ecosystems and communities in isolation, but adds to and often interacts with conventional (non-climate) threats. **Conventional threats** can affect the capacity of ecosystems to contribute to EbA. Therefore, before assessing the current and/or potential impacts of climate change, you must identify the conventional threats to ecosystems. In a later step, you will rate both conventional and climate-related threats, to identify which are the highest priority (most damaging).[7]

Define Conventional Threats (and Stresses Where Necessary)

Conventional threats are primarily human activities that directly and negatively affect the health of ecosystems and species (e.g., unsustainable fishing, illegal hunting, oil drilling, construction of roads, pollution, or introduction of invasive species). In some cases, threats can also be natural phenomena altered by human activities (e.g., predation that has increased due to proximity to human settlements and "subsidized predators" such as feral cats and racoons). You will want to name each threat in a way that clearly describes what is happening in your project site (e.g., unsustainable fishing by local fishers).

KEY TERMINOLOGY

STRESS: An impaired aspect of a target ecosystem (or target population) that results directly or indirectly from direct threats or climate change impacts (e.g., low population size; reduced river flows; increased sedimentation; lowered groundwater table level). A stress is generally a degraded key ecological attribute.

To ensure that you are including all of the conventional threats affecting your ecosystem targets, you could browse the IUCN-CMP Unified Classifications of Direct Threats. This taxonomy can also help you classify your threats (e.g., 5.4 Fishing & Harvesting Aquatic Resources), which could help you to find other teams working to address the same threat.

7 The guidance provided in this chapter draws heavily from Conceptualizing and Planning Conservation Projects and Programs (FOS 2009). For more detailed guidance, please see the chapter on identifying critical threats in Step 1C (Week 5) of that manual.

How to Identify Conventional Threats (and Stresses)

1. For each ecosystem target, identify the conventional threats affecting it

Beginning with one of your ecosystem targets, identify the most important conventional (non-climate) threats currently affecting that target. Where relevant, you should also include potential threats. See the example in Figure 9.

EXAMPLES OF CONVENTIONAL THREATS AND STRESSES

BOX 8.

There is often confusion between direct threats and stresses. These examples can help you to clearly distinguish between them.

Direct Threat	Examples	Example Target Affected
Dams	Altered stream flows Reduced reproductive success of fish	Rivers and streams Migratory fish
Unsustainable Logging	Sedimentation Habitat destruction Habitat fragmentation	Rivers and streams, Estuaries Forests
Illegal Hunting	Altered population structure	Snow leopard
Unsustainable Agriculture	Sedimentation Habitat destruction Habitat fragmentation	Rivers and streams, Estuaries Forests, Grasslands, Wetlands

It is best to limit the number of conventional threats to 10, or fewer if possible, in order to keep the project manageable. To do this, you may choose to *lump* some threats – for example, clear-cutting and selective logging could be lumped into one threat called "unsustainable logging practices." If, however, these threats are conducted by different actors (e.g., a timber company is clearcutting, while local farmers are harvesting selectively), then you would need to use different interventions to address these threats. In situations where threats require different interventions, it is best to include the threats separately.

2. (Optional) Include stresses to clarify how the conventional threat affects the target

For clarity, you may sometimes need to include **stresses** that describe the biophysical impact of the threat on the ecosystem target. For example, it may not be immediately clear how overgrazing is affecting alpine and subalpine grasslands. If we know that cattle are compacting the soil and causing soil erosion, it can be helpful to include these stresses so all stakeholders share a common understanding of the situation (see Figure 10). Because including too many stresses will quickly complicate your situation analysis, we recommend using stresses only when needed to describe complex or unclear relationships between the conventional threats and ecosystem targets.

QUESTIONS TO HELP IDENTIFY CONVENTIONAL THREATS

BOX 9.

- What human activities are currently taking place in and around your target ecosystems, and how do they affect these ecosystems?
- Are there any natural phenomena that represent significant direct threats to these ecosystems?

FIGURE 9. EXAMPLE OF CONVENTIONAL THREATS TO ECOSYSTEM TARGETS

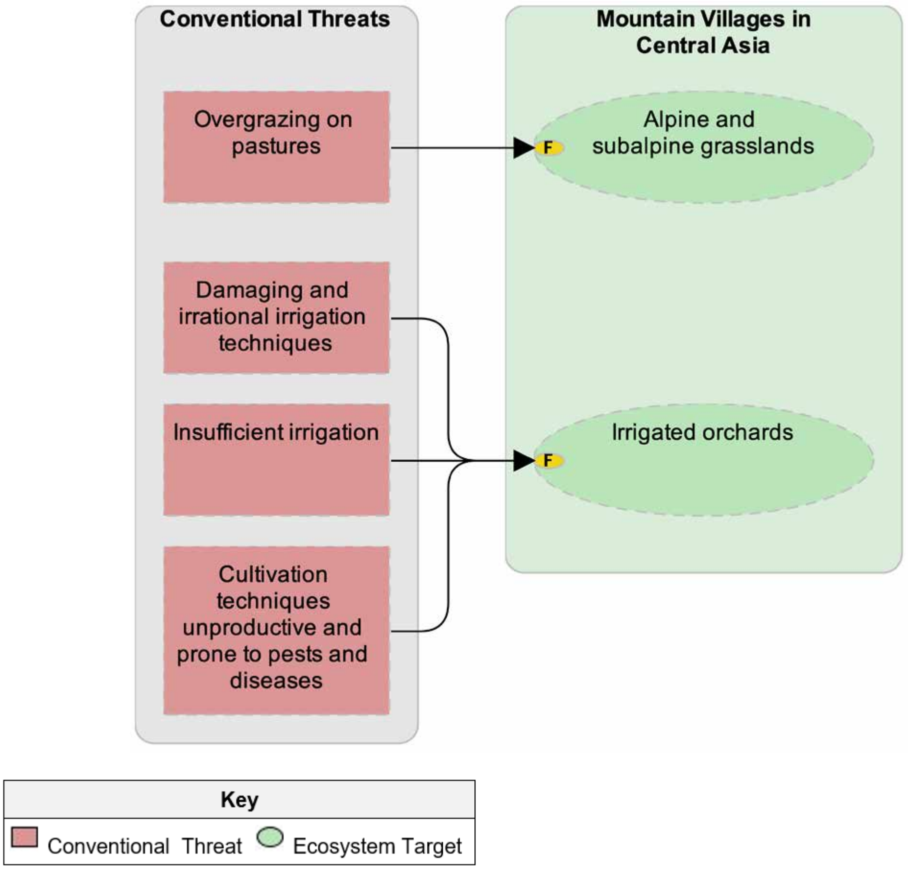
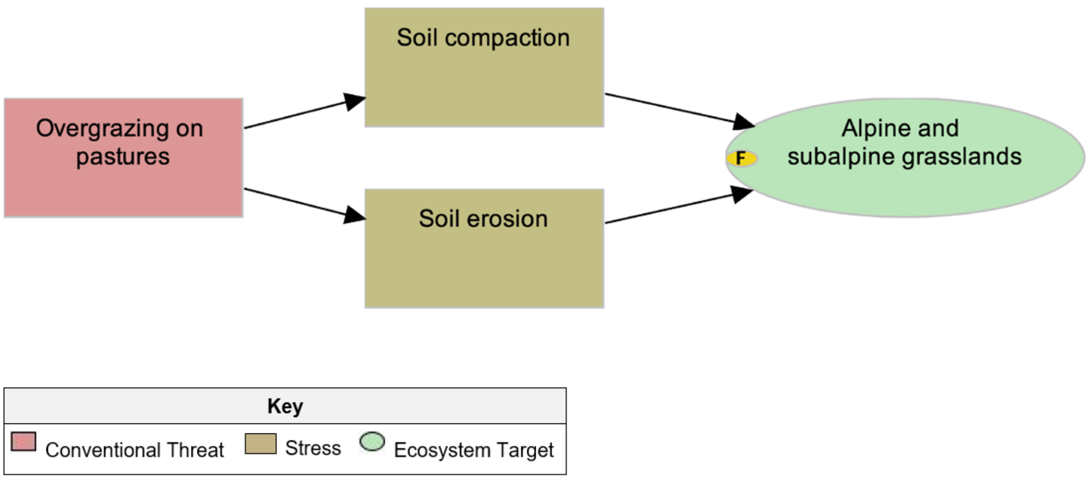


FIGURE 10. EXAMPLE OF A CONVENTIONAL THREAT AND STRESSES AFFECTING AN ECOSYSTEM TARGET



Step 5. Understand the Vulnerability of Ecosystems and Communities to Climate Change

Define Climate Scenarios

In the previous step, you worked to understand the range of conventional (non-climate) threats to the ecosystems and species that support the human community. The next step is to understand how climate change may either directly or indirectly affect ecosystems. In the climate change community of practice, the process of gaining this understanding is called a **climate vulnerability assessment**. We suggest that you focus your vulnerability assessment specifically on the ecosystems and species that support the human community with which you are working. This will enable you to understand how the people of the community are likely to be affected by climate, so that they can plan appropriate activities to adapt and not react in ways that undercut the health of the very ecosystems on which they depend.

To better understand the degree of uncertainty about future climates, we recommend using **scenario planning**. Our understanding of future climate change is usually based on **projections** from climate modeling, which represent the output of one model of a given climate parameter (e.g., monthly precipitation). When there are a number of different climate models, it can be hard to know which ones are most accurate. Scenario planning is a tool for assessing multiple plausible futures and evaluating the consequences of making different decisions in the face of uncertainty. It helps you understand the uncertainty associated with future climate, climate model projections of that future, and the associated impacts of the possible projections.

KEY TERMINOLOGY

CLIMATE VULNERABILITY ASSESSMENT: The process of assessing how climate change is likely to impact your ecosystem targets.

SCENARIO PLANNING: The use of climate scenarios to identify potential future changes to ecosystem targets in order to identify uncertainty and plan accordingly for monitoring and adaptation.

PROJECTION (OF CLIMATE CHANGE): The output of one general circulation model for a given climate parameter, for a specified time in the future.

PREDICTION (OF CLIMATE CHANGE): A climate parameter for which all consulted general circulation models (GCMs) agree for the foreseeable future. If all GCMs project similar results for a specific parameter (e.g., temperature), then these projections can be considered a prediction.

In some cases, climate models generally agree on specific parameters (e.g., amount of temperature increase) and thus produce **predictions**. Because there is little or no uncertainty, it is not necessary to develop climate scenarios for that parameter, but it needs to be taken into account in all scenarios used for intervention planning. If there is no uncertainty about any of your climate parameters, then you will not need to do scenario planning.

Scenario Planning

With a long history of use in military and business affairs, scenario planning is particularly applicable to situations characterized by high impact, uncertainty, and complexity, as well as low controllability. Climate change meets all of these criteria. Scenario planning is designed to help teams think broadly and imagine a future that could be very different from the past or present. It involves analyzing different possible futures and then developing hypotheses about what is likely to happen under these future conditions.

How to Define Climate Scenarios for the Project Area

We recommend a stepwise approach to scenario planning. This involves identifying important variables with high uncertainty (such as changes in temperature and precipitation) and using them to define climate scenarios -- e.g., "dry desert" (hot and dry) and "tropical swamp" (warm and wet). The team then draws and describes the ecological and socioeconomic impacts of these scenarios. We describe the process in more detail here:

1. Develop a "local" seasonal calendar for your project scope with stakeholders

A seasonal calendar is a simple tool used to understand the annual climate cycle in the project area and how climate influences ecosystems and species, natural resource based human activities, and human cultural events. It is described in Figure 5 in Step 2 of this manual. The calendar provides a description of the "seasons" in the project area as they currently are (spring, summer, fall and winter or the rainy season and dry season, with the corresponding months for this particular setting) and it can help teams begin to identify critical times when changes in climate may have a significant effect on ecosystems, natural resource management activities or disaster risk. For example, in many regions farmers traditionally cut and bale hay during a dry period in autumn. Rain during this time can cause the hay to rot, significantly affecting their livelihood.

2. Discuss Observed Changes in Climate

Ask local residents to describe the changes in climate that they have observed to date. Have they observed any of the following?

- increases in temperature
- changes in precipitation patterns (including certain months being rainier or drier than usual, rain instead of snow, or ice on top of snow)
- changes in the length of seasons (e.g., spring arriving earlier, first frost coming later)
- examples of asynchronous behavior (e.g., plants flowering before the arrival of migratory butterflies that pollinate them)
- increases in the frequency of extreme weather events

You can capture observed changes in climate -- and the impacts of these changes on ecosystems and natural resource management activities – in the seasonal calendar. Define **climate threats** (see Box 10) to describe the observed changes in climate and then discuss the impact they are having on your ecosystems and natural resource management activities. If you document the climate threats and their impacts in a different color (e.g., we use red text, as shown below in Box 12), it will be easy to distinguish them from conventional threats.

Make sure that there is a demonstrable connection between these observed changes and climate change. There is sometimes a tendency to attribute all observed stresses affecting key ecosystems to climate change, even when in reality conventional threats are as important or even more important than climate change impacts.

Hint: you need to ask probing questions, to understand the extent to which the changes people have observed are due to climate change or other factors.

3. Use different Representative Concentration Pathways (RCPs) and global circulation models to identify important variables with high uncertainty

The basic idea of this step is to use the outputs of climate models to identify variables that are both important for the health of your ecosystem targets and for which there is uncertainty. There is often uncertainty related to temperature or precipitation and you may want to look at this either throughout the year or during a specific season or month. For example, you could choose to focus on gradual warming throughout the year, extreme heat events during the summer, overall annual precipitation, or frequency of drought during the rainy season.

It is possible that all of the models will agree with respect to how much change is expected in the most important variables. For example, a team developing a plan for the Altai-Sayan ecoregion in Russia recently found that there was little variability in climate model outputs, so they used just one climate scenario. If you do not find uncertainty related to important variables, you may also decide to use only one climate scenario. In this case, you should skip steps 3-5 and 7.

However, more often than not, there is variability between the outputs of the models. Some models will indicate that precipitation will increase and some will indicate a decrease in precipitation. This variability needs to be captured in your climate scenarios. For those outputs where there are differences, the planning team (including representatives from target communities) should decide which uncertain variables would be most consequential for the well-being of the communities. We recommend prioritizing no more than two key variables

WHAT IS A CLIMATE THREAT?

BOX 10.

The Conservation Standards define a direct threat as:

"primarily human actions that immediately degrade one or more conservation targets. For example, 'logging' or 'fishing.' They can also be natural phenomena altered by human activities (e.g., increase in extreme storm events due to climate change)."

In this manual, we distinguish between the two main types of direct threats that are included in the Conservation Standards definition:

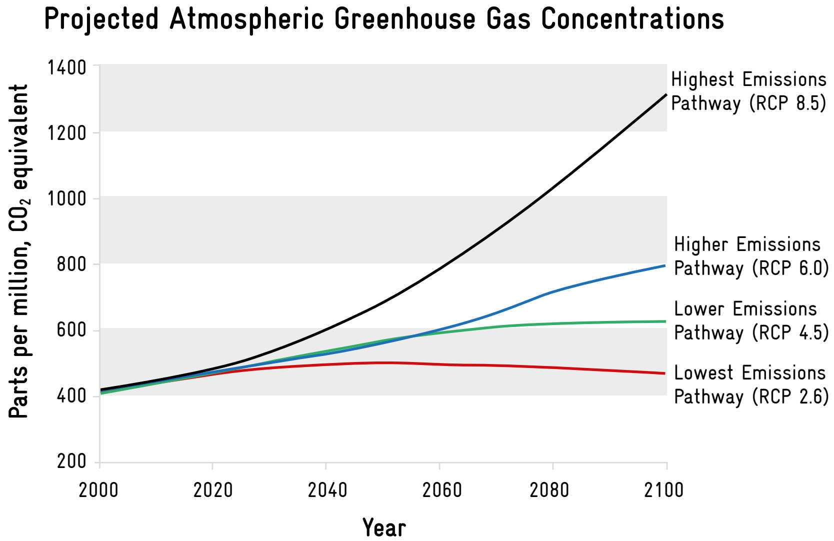
- *Conventional Threat:* human actions that immediately degrade one or more ecosystem targets (e.g., uncontrolled grazing, overharvesting of fuelwood, poaching)
- *Climate Threat:* natural phenomena altered by the mainly human-caused increase in global surface temperature and its projected continuation (e.g., increased spring precipitation, decreased snow pack)

Examples of Climate Threats:

- Changes in precipitation regime, Increase in extreme storms
- Increased air temperature (if it acts directly on the target)
- Increased water temperature (if it acts directly on the target)
- Sea level rise, Ocean acidification
- Decreased snowpack
- Increased frequency or intensity of storms

BOX 11.

PROJECTED ATMOSPHERIC GREENHOUSE GAS CONCENTRATIONS



Source: Figure created by the US Environmental Protection Agency from data in the Representative Concentration Pathways Database (Version 2.0.5) http://www.iiasa.ac.at/web-apps/tnt/RcpDb

Climate scientists have defined four standard RCPs to project possible global greenhouse gas emissions by humans and the associated concentration of those greenhouse gases in the atmosphere (see above graph). The four standard RCPs used by the international climate community include: RCP8.5, RCP6, RCP4.5 and RCP2.6, with 8.5 representing the greatest greenhouse emissions (worst case sceenario) and 2.6 the least (best case scenario). Climate models use the various RCPs as a starting point to model what the climate might be like in a particular place (such as your project area), during a specific timeframe (e.g., 2030 - 2050, or 2050 - 2100). We suggest that at least some of the climate models you use should be based on the 8.5 concentration pathway, so that the project understands the worst case scenarios.

in order to avoid overcomplicating the planning. Annex 3 includes advice about how to work with climate scientists and use climate data from global circulation models.

It is not absolutely necessary to use climate modelling data to define the variables in your scenarios. The project could decide to select variables based on recent trends in climate or historic catastrophic events. However, by using modeling data, the outputs of the planning process will be more systematic and robust.

We suggest you look at the outputs from as many climate models as possible, so that you can understand the range of variation for important variables. If climate scientists tell you that models are not available for your project area, we recommend using Climate Wizard, an online tool that enables technical and non-technical audiences alike to access leading climate change information and visualize the impacts for any region in the world. Climate Wizard enables users to view historic temperature and rainfall maps, view state-of-the-art future predictions of temperature and rainfall, and view and download climate change maps in a few easy steps. Instructions for using Climate Wizard are included in Annex 4.

4. Select two or more key variables with high uncertainty

After examining the climate model outputs, select two important climate variables. These variables should be consequential for either humans or the ecosystems that humans depend on and they should vary considerably between the climate models. Use these variables to construct a quadrant. The quadrant shown in Figure 11 describes four possible future climates based on two variables (spring precipitation and extreme heat events during the summer). The seasonal calendar can help you specify the timing of the variables (e.g., precipitation during the winter and spring). Focusing on locally relevant seasons (defined by the seasonal calendar) or other key periods is more helpful than using annual averages.

While temperature and precipitation are common climate variables to consider in scenario planning, it is also possible to use other biophysical variables, such as snow cover, shifts in the timing of seasons (e.g., earlier spring), sea-level rise, extreme storms, or the frequency and magnitude of droughts, if your projections provide meaningful data about these variables. It is also possible to use socioeconomic or political variables, such as the political will to address climate change. Rowland et al. (2014) describes many examples of scenario planning, including some that incorporate variables such as societal concern about climate change (which ranges from widespread indifference to a broad understanding of the heightened urgency of climate change) and the level of leadership in institutions responsible for addressing the problem.

5. Name the scenarios in the quadrant

It is best to give the scenarios memorable names that participants in the planning team will understand and remember. There is nothing wrong with a humorous name that speaks to the conditions of that scenario (e.g., "I should have postponed my wedding" for the scenario including wet spring conditions and the same number of extreme summer heat events).

6. For each scenario, draw and describe the ecological and socioeconomic impacts, plus human response to climate change impacts (vulnerability assessment)

This is the heart of the vulnerability assessment – where you consider the consequences of future climate scenarios. Thinking through each scenario

FIGURE 11. PARAMETER QUADRANT FOR SCENARIO PLANNING FOR A MOUNTAIN VILLAGE IN CENTRAL ASIA

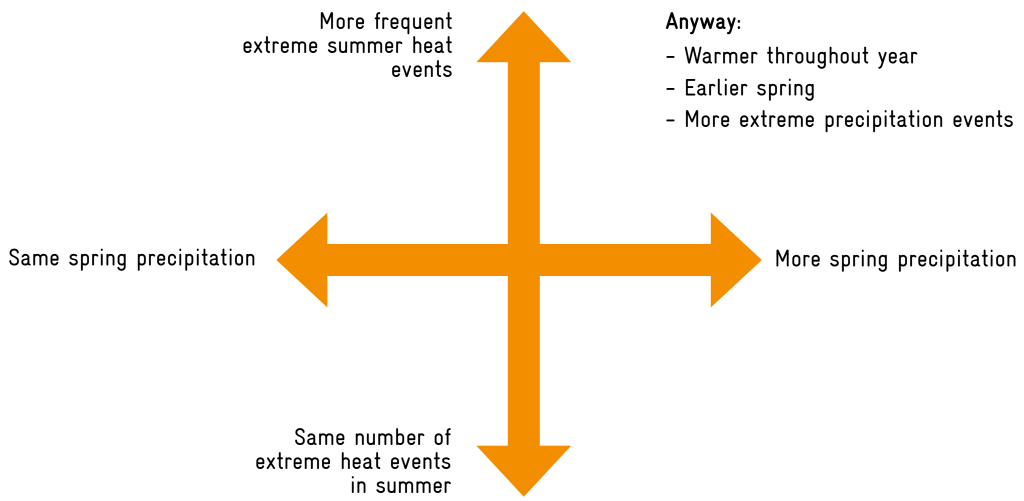
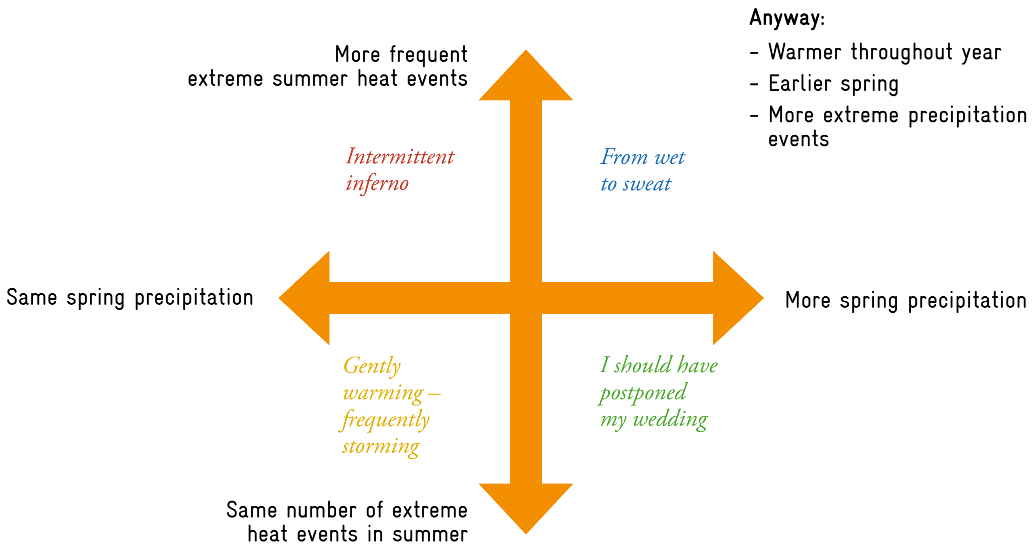


FIGURE 12. PARAMETER QUADRANT WITH NAMES FOR EACH CLIMATE SCENARIO



individually, document the expected impacts of that scenario in terms of:

- Direct impacts on ecosystems and species, including the provision of ecosystem services (e.g., increasing temperature will change the composition of forest ecosystems and cause certain species to move to higher altitudes)
- Direct impacts on humans (e.g., increasing temperature could cause the introduction of new diseases)
- (If relevant) Indirect impacts on ecosystems and species, based on how humans are likely to react to the climate changes (e.g., increasing temperature will cause farmers to move their livestock and crops to higher altitudes, potentially causing more human-wildlife conflict)

Describe how ecosystems, species, and humans are likely to be impacted by the relevant changes in climate, and how humans are likely to react to the changes (see Figure 13). Because there is rarely published research on the impacts of specific climate scenarios, the planning team will need to discuss and summarize qualitative information about possible impacts from local experience. Local people may not have experienced any of the scenarios in full, but they have usually experienced elements of the different scenarios in recent history (e.g., extreme weather events, drought, etc.), along with their impacts.

Update the ecological drawing developed in Step 2 to include the climate impacts projected for each scenario (see Figure 14). Begin with the drawing developed earlier that includes all of the different ecosystems and human activities in the landscape, as well as the ecosystem services connecting them. Then add the expected climate impacts associated with the climate scenario, using different colors that allow the climate impacts to stand out from the original drawing.

7. Summarize the outcomes of all of the scenarios

Be sure to capture a summary of the work from each scenario. One option is to add summaries of each of the scenarios to the quadrant. Figure 15 shows how four scenarios were named and described by members of a small village in Kyrgyzstan. Another option is to write short, narrative descriptions of each of the scenarios. You are now ready to integrate this infor-

FIGURE 13. POTENTIAL ECOLOGICAL AND SOCIOECONOMIC IMPACTS OF THE "BIG RELIEF" SCENARIO

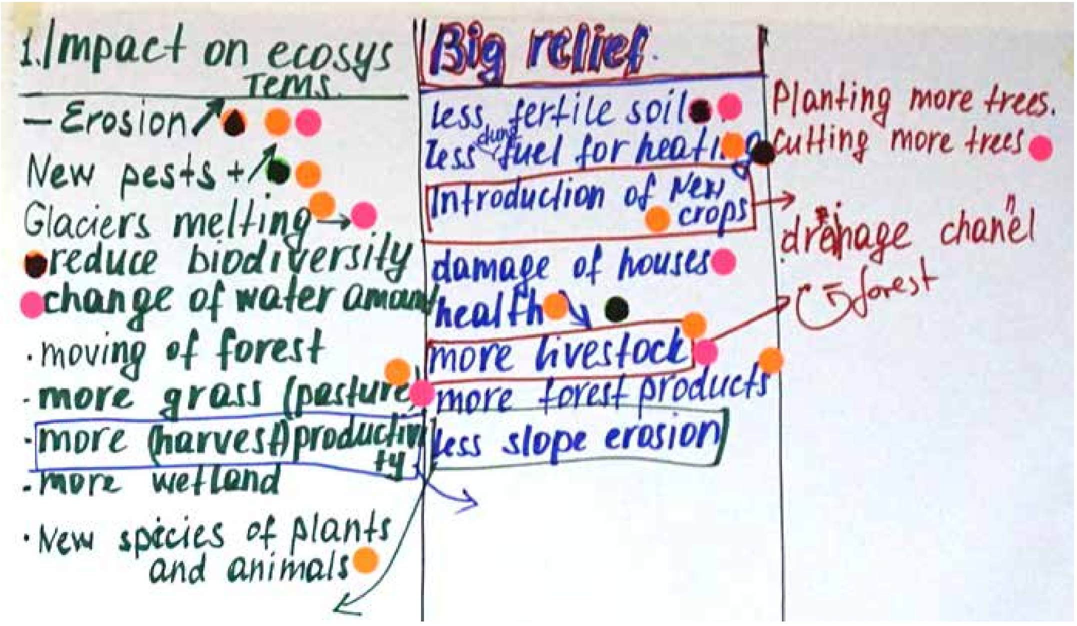
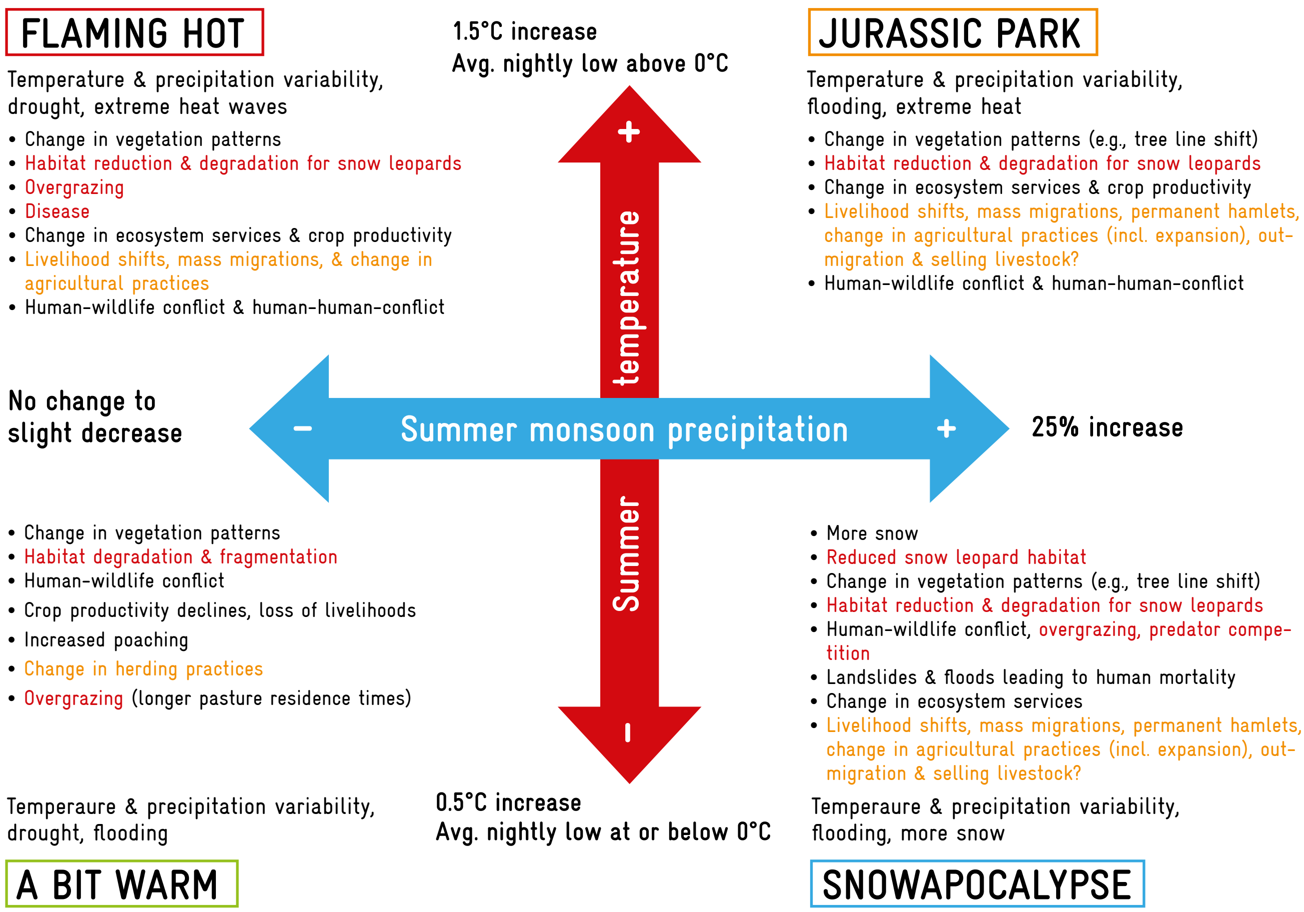


FIGURE 14. ECOLOGICAL DRAWING OF POTENTIAL IMPACTS OF A "BIG RELIEF" SCENARIO

FIGURE 15. PROJECTED IMPACTS OF FOUR CLIMATE SCENARIOS IN A VILLAGE IN KYRGYZSTAN



mation with the conventional threat information into one or more situation models.

8. Decide Which Climate Scenarios to Focus On

While the quadrant provides a good starting point for discussion about the potential impacts of climate change under different conditions, you will not necessarily need to incorporate the climate impacts of all four scenarios into your project situation model. If the four scenarios are significantly different and all consequential, then you may want to consider all of them, in order to avoid maladaptation. However, planning for four different scenarios can be cumbersome and it may be sufficient to focus on only two different scenarios.

Work with community members to select climate scenarios that represent consequential change (good and/or bad) for the community and the ecosystems that local people depend on. Consider the following selection criteria:

- The "worst case" scenario, with the most negative consequences
- The "best case" scenario, with the most positive or least negative consequences
- The least understood scenario(s);
- The "least change" scenario, that is closest to the current and/or historic site conditions

In the example shown in Figure 16, the team decided that one scenario ('From wet to sweat") was the "worst case" scenario and they wanted to explore this possible scenario. They also chose to consider the "Intermittent Inferno" scenario, because it could have significant implications on agricultural productivity. However, they felt that it was not worth discussing the "Gently warming - frequently storming" scenario, which was closest to the status quo, because they felt it was unlikely that conditions would remain the same. In many cases, however, considering the "least change" scenario can help teams recognize that the future will not be the same as the past -- they will need to plan for at least the changes included in this scenario, if not more significant changes.

9. Incorporate Projected Climate Impacts Into One or More Situation Model(s)

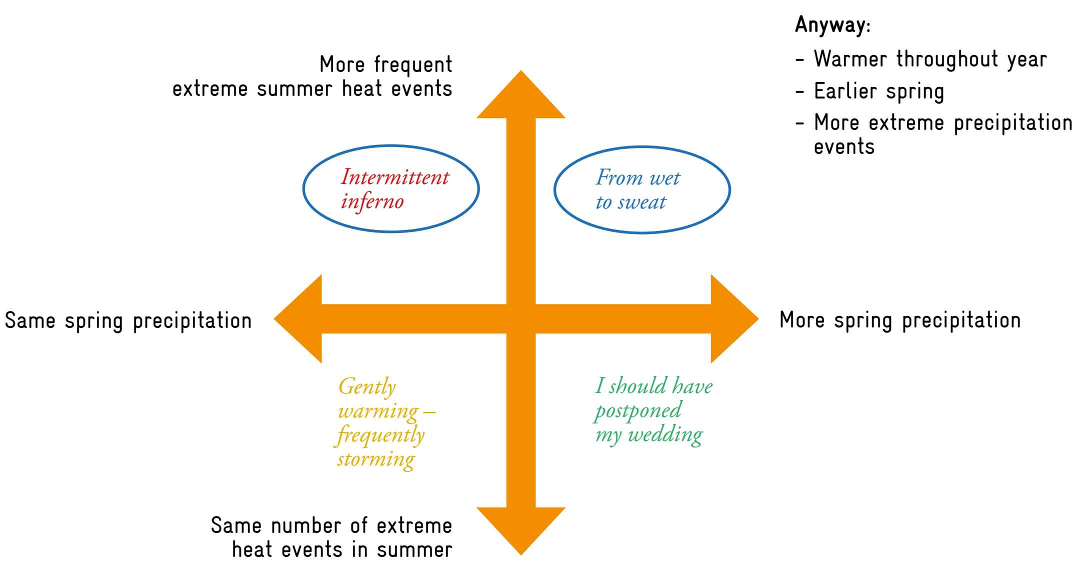
This step involves linking the projected impacts of climate change described in the different climate scenarios to the ecosystem targets, human well-being targets and conventional threats in the project situation model. To do this, define climate threats that summarize the projected changes (see Box 10 above for definitions). Below, Box 12 shows examples of the different ways that climate threats can interact with ecosystem targets and conventional threats in a situation model.

10. (Optional) Include Stresses in the Situation Model

When adding climate threats, it is sometimes helpful to include **stresses** (see Box 12), to describe the biophysical impact of the threat on the ecosystem or human well-being target. As shown in the example below (see Figure 17), a climate threat ("more frequent, heavy precipitation events") and a conventional threat ("overgrazing") can both contribute to the same stress affecting an ecosystem ("sedimentation" of rivers and streams). Showing these linkages can help the project team recognize that addressing overgrazing is even more important when considering the projected increase in the frequency and intensity of heavy precipitation events.

Sometimes including a chain of stresses can help tell a story about what is happening at a site and how climate change may be exacerbating existing problems. Adding stresses makes it easier to understand the example used above. Temperature increases throughout the year and extreme heat in summer will cause upstream glaciers to melt and a greater proportion of precipitation will evaporate rather than infiltrating into the soil. This will cause lower baseflow in the streams, which will reduce water availability during dry periods and exacerbate the

FIGURE 16. QUADRANT SHOWING SELECTED CLIMATE SCENARIOS



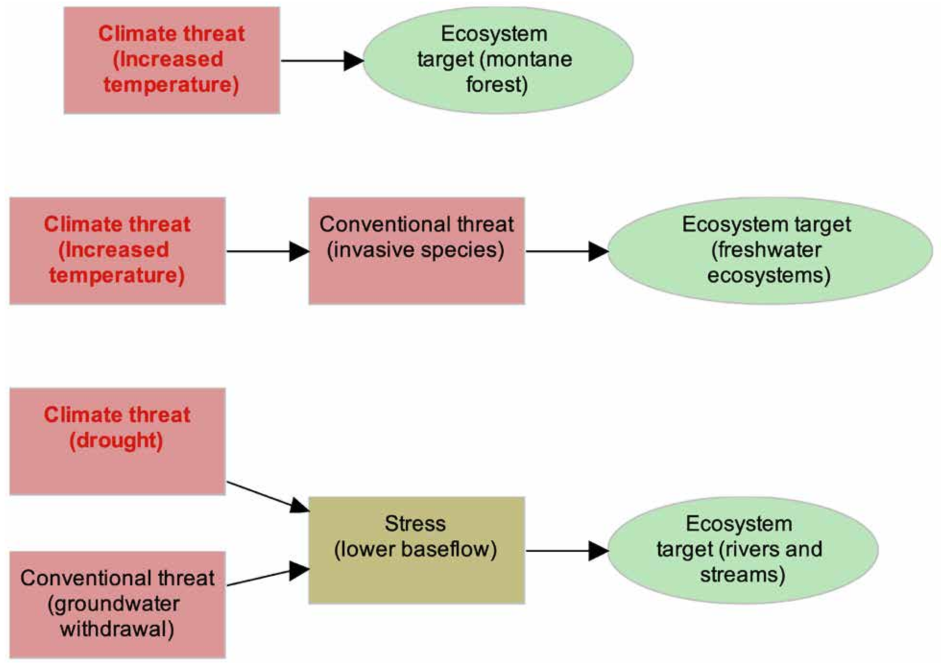
Step 5.

HOW TO REPRESENT CLIMATE THREATS IN A SITUATION MODEL

BOX 12.

There are several different ways to include climate threats in a situation model. First, a climate threat can affect an ecosystem target directly (e.g., increased temperature changes the composition of a montane forest ecosystem). Second, a climate threat can exacerbate a conventional threat (e.g., increased temperature causes invasive plants to spread more aggressively). Third, a climate threat and a conventional threat may both affect the same stress (e.g., both uncontrolled withdrawal of groundwater and drought lowers baseflow in streams are rivers).

Stress (optional): aspects of an ecosystem target's ecology that are impacted directly or indirectly by conventional threats and/or climate threats (e.g., forest habitat degradation, flooding, landslides)



problem of insufficient irrigation of irrigated orchards.

When a situation is complex and there are lots of interactions between the factors (conventional threats, climate threats and stresses) in your situation model, it can be helpful to focus first on what is causing what and **then** decide which factor (in a chain of factors) to treat as a climate threat. If you do this, consider the following when selecting the factor to treat as a climate threat:

- No "double counting"! Be careful not to define more than one climate threat in the same chain (e.g., increased temperature and more evaporation in Figure 19). If you choose to rate your climate threats, you want to make sure that you aren't rating the same impacts twice.
- Climate threats are often the immediate effects of a higher atmospheric concentration of Greenhouse Gases (what climate experts call "exposure" factors, see Box 13). In the example below in Figure 20, "increase in temperature" and "change in precipitation regime" are both exposure factors

and could be treated as climate threats. "Altered fire regime" is an example of a "sensitivity" factor, which in Conservation Standards language are usually stresses (altered key ecological attributes).

- If your chain of factors includes multiple **exposure** factors (e.g., an increase in air temperature leading to an increase in water temperature that is decreasing the habitat of brook trout), then select the exposure factor that is furthest "downstream" or closest to the ecosystem target (e.g., "increase in water temperature").
- **Do what makes the most sense and don't get stuck!**

The situation model is intended to help your team develop a shared mental model of your site -- what ecosystem targets you are working to conserve, the conventional threats to these ecosystems, and the climate threats that will probably affect them in the future (and may already be affecting them). Find the level of detail that helps you to portray the situation and will allow you to define interventions (for both conservation and climate adaptation) in later steps. In addition to the Central Asia example shown in Figure 21, we have included a second example situation model in Annex 5.

FIGURE 17. EXAMPLE OF A CONVENTIONAL THREAT AND A CLIMATE THREAT THAT AFFECT THE SAME STRESS

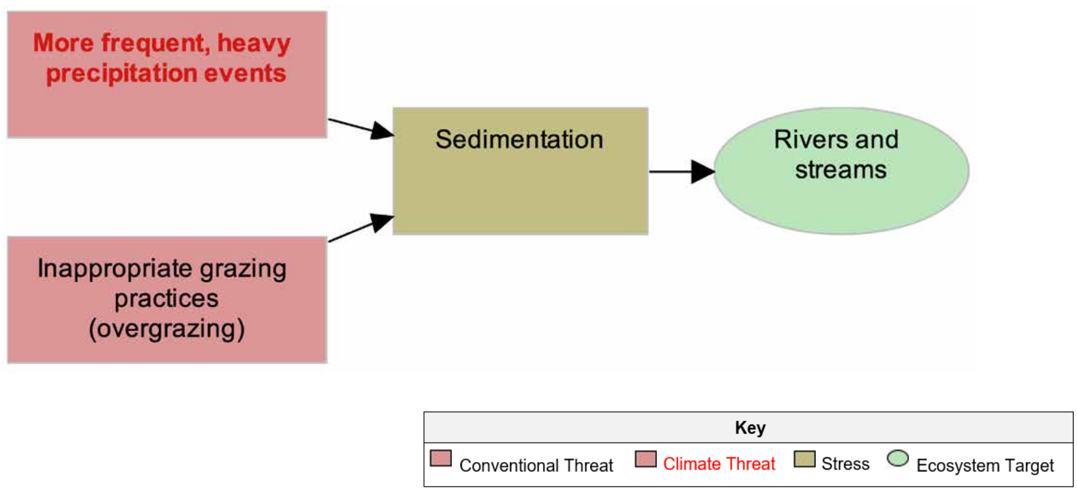


FIGURE 18. EXAMPLE OF A CLIMATE THREAT EXACERBATING A CONVENTIONAL THREAT

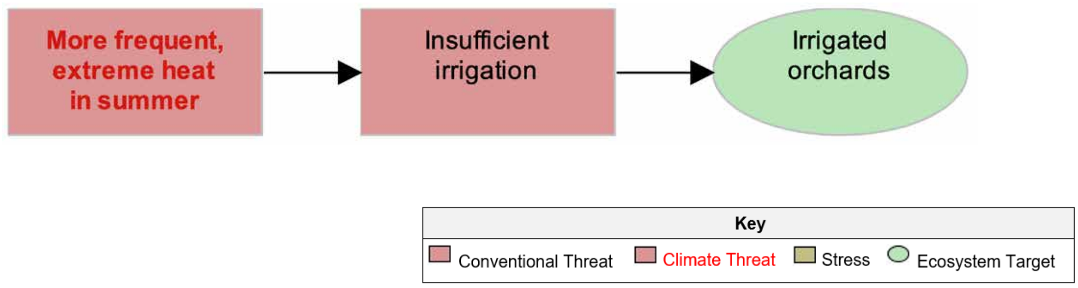


FIGURE 19. EXAMPLE OF CLIMATE THREATS CAUSING STRESSES THAT EXACERBATE A CONVENTIONAL THREAT

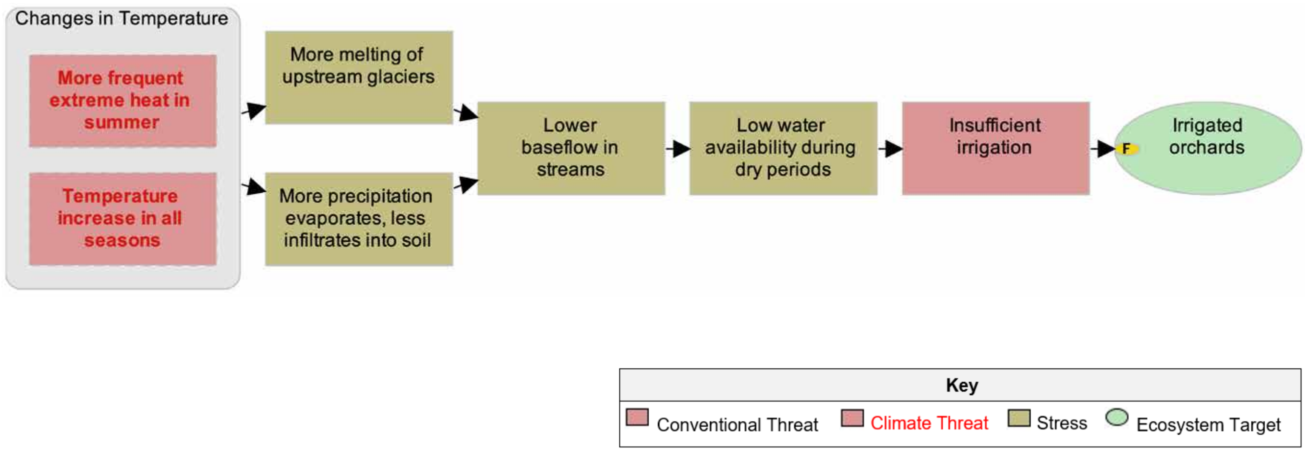
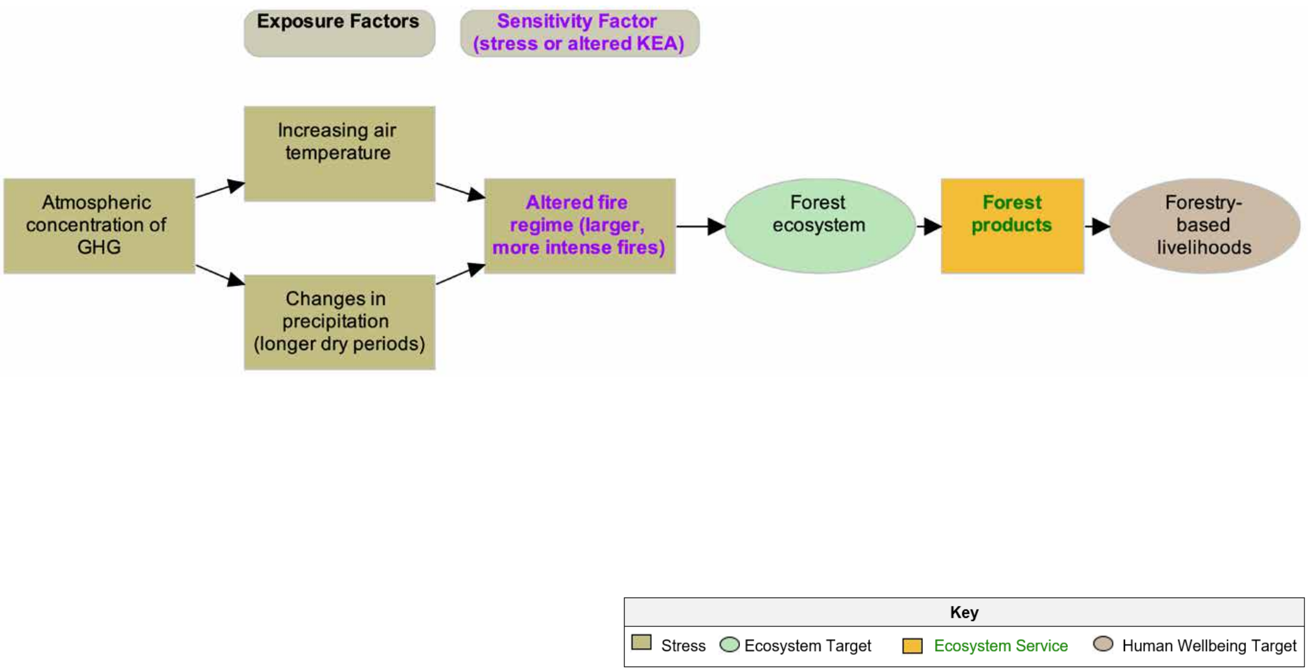


FIGURE 20. EXAMPLES OF EXPOSURE AND SENSITIVITY FACTORS



Example Situation Model, Showing Targets, Threats and Stresses

In the example shown in Figure 21, the team defined five climate threats: more spring precipitation, more frequent extreme heat in summer, temperature increase in all seasons, more frequent heavy precipitation events, and early onset of spring. It is worth noting that some of these climate threats are projected to occur under all scenarios (e.g., temperature increase in all seasons and early onset of spring), while others will only occur in some scenarios (e.g., more spring precipitation).

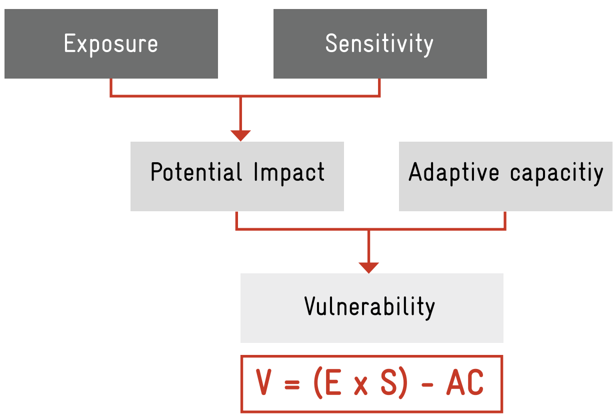
In our example, the team was able to include the projected impacts of different scenarios into the same situation model. While this is ideal (to keep things simple and to produce one consistent set of adaptation interventions, all of which are robust under all climate scenarios), it is not always feasible. Sometimes two or more scenarios are significantly different and including all of their projected climate impacts in one situation model would be confusing. For example, if one scenario includes increased precipitation and associated flooding and landslides, while another scenario includes drought and desertification due to decreased precipitation, the project team may need to show these projected changes in different models.

WHAT IS VULNERABILITY TO CLIMATE CHANGE? BOX 13.

Among climate experts, **climate vulnerability** refers to the degree to which an ecological system, habitat, or individual species is likely to experience harm as a result of changes in climate. It is a function of exposure, sensitivity and adaptive capacity. The Intergovernmental Panel on Climate Change (IPCC) defines these terms as:

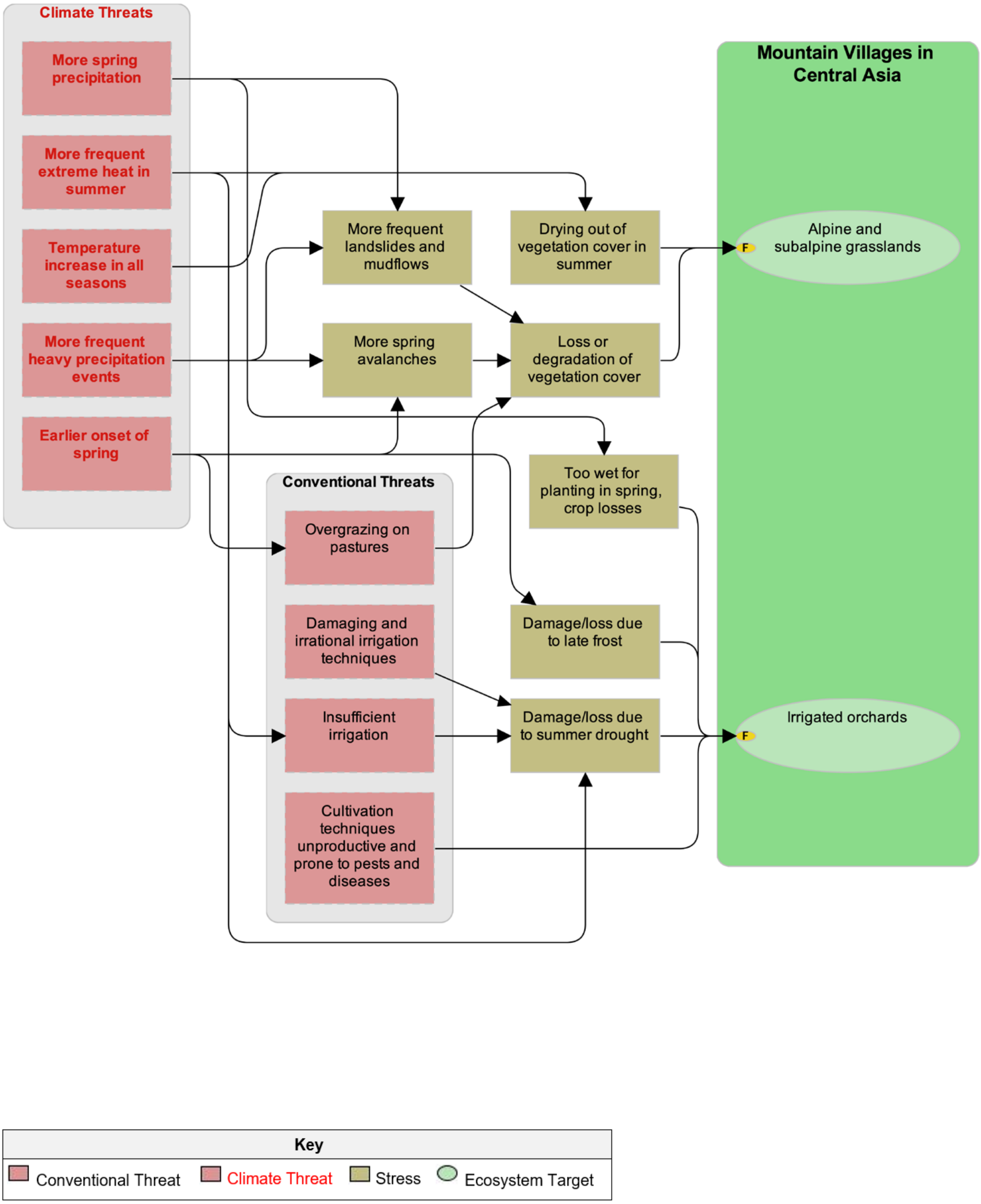
- *Exposure:* the nature and degree to which a system is exposed to significant climate variations
- *Sensitivity:* the nature and degree to which a system is affected, either adversely or beneficially, by climate-related stimuli
- *Adaptive capacity:* a measure of the ability of a system or species to adjust to climate change impacts with minimal disruption

In the picture below, sunlight is the exposure factor, fair skin is the sensitivity factor, and the person's ability to move into the shade or put on sunscreen are examples of their adaptive capacity. We will discuss adaptive capacity later, during the selection of interventions.



Glick et al. 2011

FIGURE 21. EXAMPLE OF CONVENTIONAL THREATS AND CLIMATE CHANGE IMPACTS AFFECTING ECOSYSTEMS THAT SUPPORT A MOUNTAIN VILLAGE IN CENTRAL ASIA



Step 6. Prioritize Threats

Rate the Threats

Once you have identified both the conventional and climate threats facing the ecosystem targets, you need to prioritize the *critical (conventional and climate) threats* affecting your targets. The threat rating helps you prioritize where, with limited resources, adaptation interventions are most urgently required and likely to be most effective. It enables the planning team to focus on those climate change impacts and conventional threats that have the most severe impact on ecosystems and their capacity to sustain livelihoods.

How to Rate Conventional Threats and Climate Threats

Please refer to both Step 4 "Identify Threats" and Step 5 "Understand the Vulnerability of Ecosystems and Communities to Climate Change" for more details about identifying conventional and climate threats.

1. Review threat-target combinations in the situation model and rate them individually using the rating criteria

Using your situation model, review the links you identified between threats and targets. Rate every threat-target combination individually according to the following rating criteria (see Tables 5 & 6 below):

You may decide to use Miradi software to rate your threats. Miradi automatically produces summary ratings for every threat-target combination, overall ratings per threat, the level of impact on targets, and the overall rating of your project or program. Unfortunately, at the time of publishing this guidance, the Miradi software is not fully equipped to rate climate threats. If you use the software to document this process, you will not find the 'management challenge' criterion. Instead, you can continue to use the conventional threat rating input for 'irreversibility' and recognize as a team that you are rating 'management challenge.' Make sure to document your approach, so as not to cause confusion in the future.

2. Review summary ratings and identify critical threats

After rating your threats, review the summary rating table (Figures 22 and 23) and ensure that the ratings make sense. Select the most critical threats. These are often the highest rated ones as they need urgent action. However, you may select lower threats that you expect to be critical over the long term and currently have potentially effective mitigation and adaptation interventions (e.g., invasive species that must be addressed now, because it will not be possible to control them if they get well established).

TABLE 5. CRITERIA FOR RATING CONVENTIONAL THREATS

Criteria	Definitions
Scope - The proportion of the target that can reasonably be expected to be affected by the threat within **ten years** given the continuation of current circumstances and trends. For ecosystems and ecological communities, measured as the proportion of the target's occurrence. For species, measured as the proportion of the target's population.	**Low** - The threat is likely to be **very narrow** in its scope, affecting the target across a small proportion **(1-10%)** of its occurrence/population.
	Medium - The threat is likely to be **restricted** in its scope, affecting the target across some **(11-30%)** of its occurrence/population.
	High - The threat is likely to be **widespread** in its scope, affecting the target across much **(31-70%)** of its occurrence/population.
	Very High - The threat is likely to be **pervasive** in its scope, affecting the target across all or most **(71-100%)** of its occurrence/population.
Severity - Within the scope, the level of damage to the target from the threat that can reasonably be expected given the continuation of current circumstances and trends. For ecosystems and ecological communities, typically measured as the degree of destruction or degradation of the target within the scope. For species, usually measured as the degree of reduction of the target population within the scope.	**Low** - Within the scope, the threat is likely to only **slightly degrade/reduce** the target or reduce its population by **1-10%** within ten years or three generations.
	Medium - Within the scope, the threat is likely to **moderately degrade/reduce** the target or reduce its population by **11-30%** within ten years or three generations.
	High - Within the scope, the threat is likely to **seriously degrade/reduce** the target or reduce its population by **31-70%** within ten years or three generations
	Very High - Within the scope, the threat is likely to **destroy or eliminate** the target, or reduce its population by **71-100%** within ten years or three generations.
Irreversibility - The degree to which the effects of a threat can be reversed and the target affected by the threat restored.	**Low** - The effects of the threat **are easily reversible** and the target can be **easily** restored at a relatively **low cost and/or within 0-5 years** (e.g., off-road vehicles trespassing in wetland).
	Medium - The effects of the threat **can be reversed** and the target restored with a **reasonable commitment** of resources and/or within **6-20 years** (e.g., ditching and draining of wetland).
	High - The effects of the threat can **technically be reversed** and the target restored, but it is **not practically affordable** and/or it would take **21-100 years** to achieve this (e.g., wetland converted to agriculture).
	Very High - The effects of the threat **cannot be reversed** and it is **very unlikely** the target can be restored, and/or it would take **more than 100 years** to achieve this (e.g., wetlands converted to a shopping center).

TABLE 6. CRITERIA FOR RATING CLIMATE THREATS

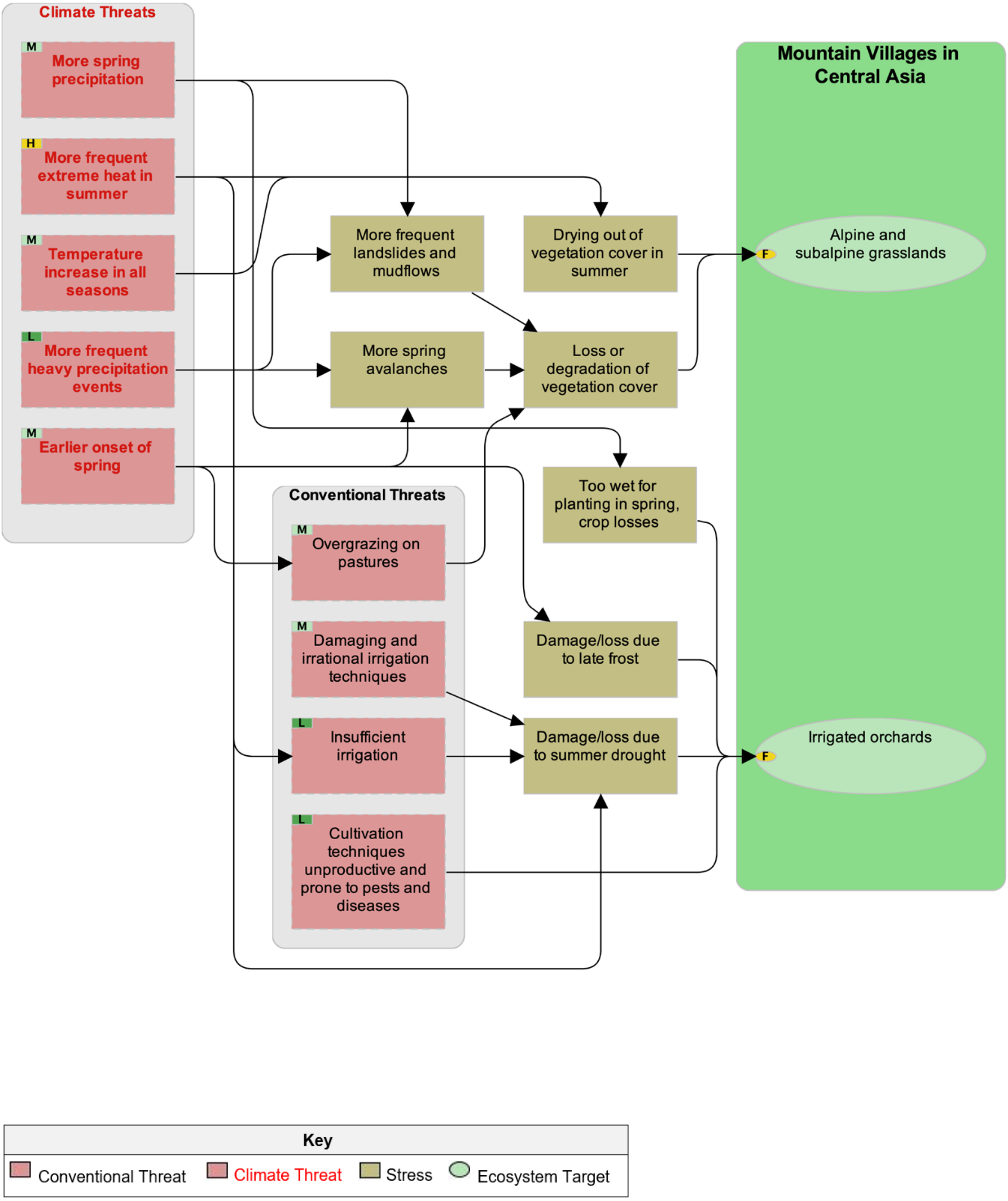
Criteria	Definitions
Scope	same as conventional threats (see table 6 above)
Severity	same as conventional threats (see table 6 above)
Management Challenge - The challenge people face in adapting to effects of a climate threat.	**Low** - It is likely that there are adaptation interventions that could help people to effectively adapt to the climate threat within a given time frame (near-term, long-term) **AND** this would take a relatively small investment of resources.
	Medium - There is some possibility the effects of the climate threat can be addressed (near-term or long-term) **AND** addressing them would be feasible with a moderate commitment of resources.
	High - There is some possibility for people to adapt to the effects of the climate threat (near-term or long-term) **BUT** adaptation interventions have **low feasibility**, because they require a moderate to high amount of resources, require actions by multiple partners, are politically challenging, or are technically challenging.
	Very High - It is very unlikely there are adaptation interventions that could help people adapt to the climate threat within the scope and time frame (near-term or long-term) **OR** adaptation interventions have very **low feasibility**, because they require a significant amount of resources (beyond what is currently available), require actions by multiple partners, are politically challenging, or are technically challenging.

Example Threat Rating

FIGURE 22. EXAMPLE RATING OF CONVENTIONAL AND CLIMATE THREATS TO ECOSYSTEMS

	Threats / Targets	Alpine and subalpine grasslands	Irrigated orchards	Summary Threat Rating
Climate change impacts	Temperature increase in all seasons	High	High	**High**
	Earlier onset of spring	Medium	Medium	**Medium**
	More spring precipitation	Medium	Medium	**Medium**
	More frequent heavy precipitation events	Medium	Medium	**Medium**
	More frequent extreme heat in summer	High	High	**High**
Conventional threats	Insufficient irrigation		Medium	**Low**
	Damaging and irrational irrigation techniques		High	**Medium**
	Cultivation techniques unproductive and prone to pests and diseases		Medium	**Low**
	Overgrazing on pastures	High		**Medium**
Summary Target Ratings:		**High**	**High**	**Very high**

FIGURE 23. CONVENTIONAL AND CLIMATE THREATS AND STRESSES AFFECTING ECOSYSTEMS AROUND A MOUNTAIN VILLAGE IN CENTRAL ASIA



Step 7. Summarize the Situation

Develop your Situation Model

Before you begin to think about adaptation interventions, you need to have a clear understanding of what is happening within your project scope. A situation analysis brings together your work on previous steps to help you create a common understanding of your project's context. This includes the biological environment and the social, economic, political, and institutional systems that affect the ecosystem and human wellbeing targets you want to conserve. The final product illustrates how climate change directly affects ecosystems and exacerbates existing, or promotes new, conventional threats. By understanding the biological and human context, you will have a better chance of developing appropriate goals and designing interventions that will help you achieve them.

Hint: The challenge here is to make your logic explicit without spending too much time trying to develop a perfect model.

A situation analysis involves an analysis of the key factors affecting your ecosystem and human well-being targets, including the conventional and climate threats already identified. Often project teams *think* they have a shared understanding of their project's context and the main threats and opportunities. However, project teams often find they have different perceptions of the same situation as they follow a formal process of finding information and documenting their assumptions. In previous steps, you have developed many components of the situation analysis. Now, we will bring those pieces together and identify the **contributing factors** (the factors that drive conventional threats), including both **indirect threats** and **opportunities**, that are relevant to the project's context.[8]

KEY TERMINOLOGY

CONTRIBUTING FACTORS: Socio-economic, institutional, cultural, capacity related, technical or other factors identified in the situation analysis that contribute to direct threats. Contributing factors can be root causes of threats or opportunities. They can be entry points for adaptation measures.

INDIRECT THREATS: A driver, or root cause, of a conventional threat.

OPPORTUNITIES: A contributing factor identified in the situation analysis that potentially is limiting one or more conventional threats, and can be enhanced through adaptation measures. In some senses, the opposite of an indirect threat.

8 The guidance provided in this chapter draws heavily from Conceptualizing and Planning Conservation Projects and Programs (FOS 2009). For more detailed guidance, please see the chapter on completing the situation analysis in Step 1D (Week 6) of that manual.

BOX 14.

COMPONENTS OF A SITUATION MODEL

Ecosystem Target: A habitat, ecological system or species on which the community depends for ecosystem services.
Conventional Threat: A human action that immediately degrades one or more ecosystem target (e.g., logging, urban development.)
Human Well-being Target: The components of human well-being affected by the status of ecosystem targets.
Climate Threat: Observed and expected changes in climate that exacerbate existing conventional threats or significantly alter an ecosystem target and impact resource management.
Contributing factor: The indirect threats, opportunities, and other important variables that positively or negatively influence conventional threats.

> **Indirect threat:** A factor identified in a situation analysis that is a driver of conventional threats, and is often an entry point for conservation actions (e.g., logging policies, human population growth).
> **Opportunity:** A factor that could have a positive effect on an ecosystem target, directly or indirectly, and is often an entry point for conservation actions (e.g. demand for sustainably harvested timber).

Scope: The broad parameters or boundaries (geographic or thematic) for a project's focus.
Stress (optional): Attributes of an ecosystem target's ecology that are impaired directly or indirectly by human activities (e.g., forest degradation or reduced area).

The following generic situation model illustrates the relationship between these factors:

How to Complete a Situation Analysis and Situation Model

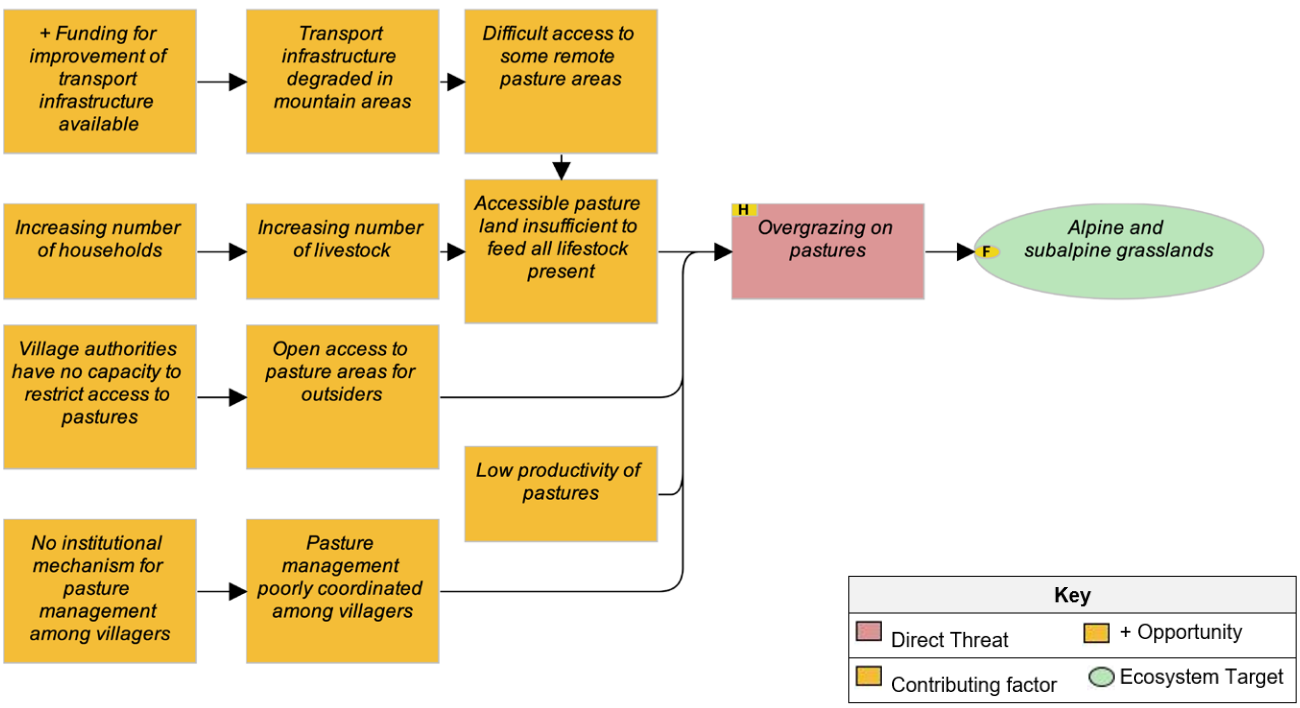
1. For each conventional threat, identify the factors (indirect threats and opportunities) contributing to the threat

Contributing factors include the economic, political, institutional, social, and cultural influences that drive or influence the conventional threats. Examples of common indirect threats include: weak legislation and enforcement, strong market demand, and limited environmental awareness. Conversely, you might have existing opportunities that could be strengthened to further deter threats, or places where opportunities could easily be created – for example, existing strong legislation, markets for certified products, a high level of awareness of conservation issues, and cultural values that support ecosystem-based adaptation. Questions to consider for this step include:

- Who is involved in this conventional threat? What exactly are they doing? Why are they conducting these activities?
- What incentives and disincentives influence this threat?
- What economic, political, institutional, social or cultural factors contribute to this threat?
- Are there positive factors (opportunities) that currently contribute or potentially could contribute to decreasing this threat?

We do not recommend defining contributing factors for your climate threats, because these factors are almost always outside of the scope of what an ecosystem-based adaptation project addresses. For example, if one of your climate threats is more frequent and severe extreme storms, the factors contributing to this are increased atmospheric concentrations of greenhouse gas (GHG) emissions and the factors contributing to that include all of the sources of those GHG emissions. While reducing GHG emissions is essential, it is typically outside of the manageable interest of local EbA projects.

FIGURE 24. SITUATION MODEL INCLUDING ONE CONVENTIONAL THREAT AND CONTRIBUTING FACTORS



2. Develop a Situation Model to Visually Portray Your Understanding of Project Context

a. In previous steps, your team defined the project scope, ecosystem targets, ecosystem services, human wellbeing targets, conventional threats and climate threats. These will represent the right hand side of your model, as seen in Box 14.
b. Add contributing factors: Indirect threats and opportunities

In your situation analysis, you have done a lot of thinking about what contributing factors are driving conventional threats that are affecting your ecosystem targets. These factors include economic, political, institutional, social or cultural influences. You are now ready to add these to your model.

You should work from right to left to place each of the factors into your model. For example, your team should ask itself, what is causing the conventional threat of overgrazing on pastures? For the threat of overgrazing on pastures, the team decided that accessible pasture land is not sufficient to feed all of the community's livestock and that outsiders have open access to this pasture land, because village authorities do not have the authority to restrict this access. As you add contributing factors, continuously ask what are the factors driving them, working to the left until you have a fairly complete explanation of why the threat is occurring. It is generally best to focus on the factors within your project's manageable interest (see Figures 24 and 25).

Do not forget to consider opportunities (e.g., favorable policy environment, community interest in conservation), as well as indirect threats. There are almost always some opportunities available. Be sure to phrase the opportunity as a neutral factor (e.g., increasing demand for sustainably produced meat) and not an intervention (e.g., promote certified holistic grazing practices). In a later step, when we discuss interventions, you can decide if you want to develop interventions to address these opportunities.

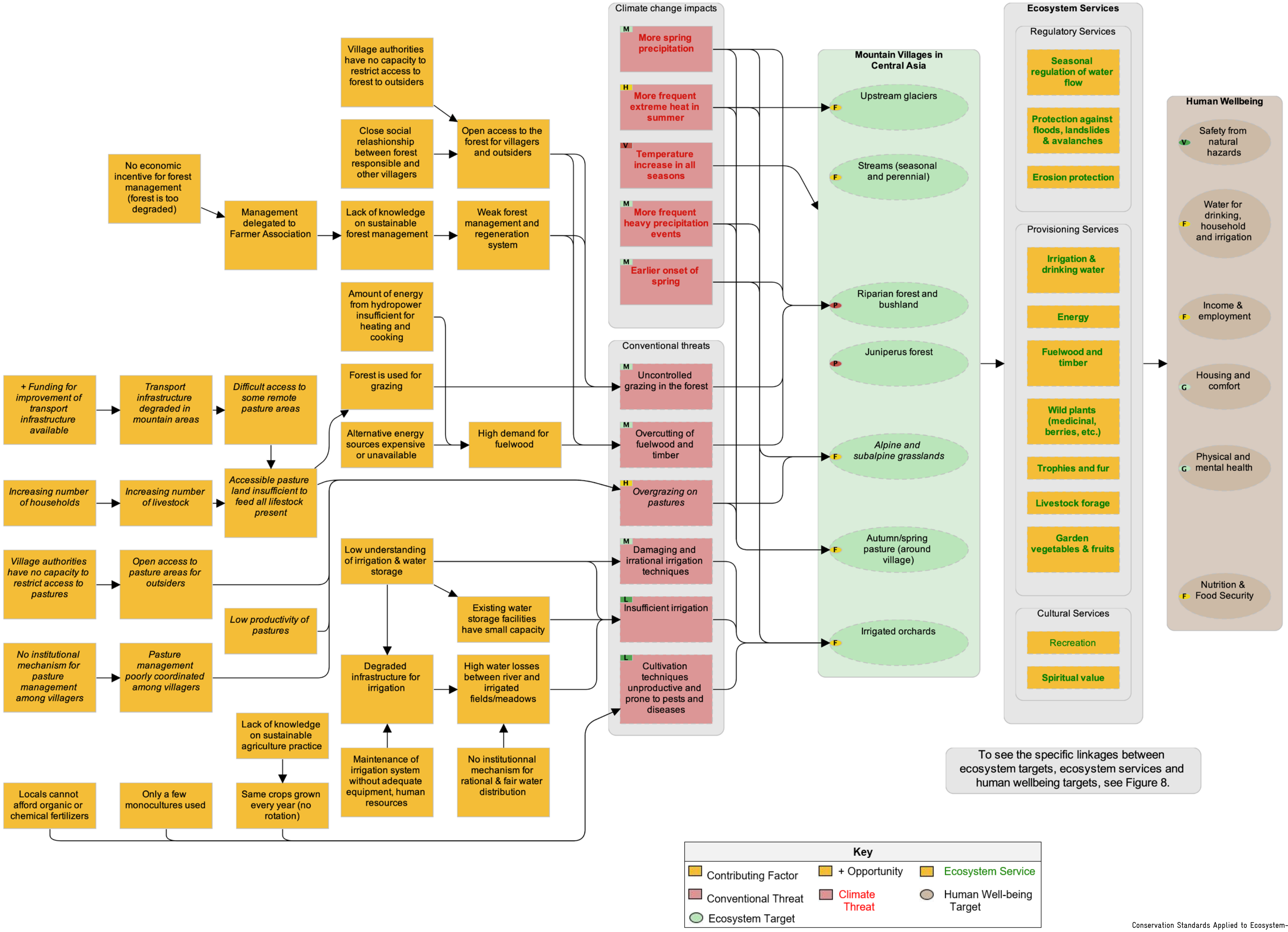
Draw arrows to show the relationship that each factor has with other factors. These arrows will help you later to identify critical factors and potential paths along which you could establish your project goals and objectives. If there are uncertainties, you can note them using question marks and try to reconcile them later through further inquiry.

- Who is undertaking what activities that contribute to this conventional threat, indirect threat or opportunity?
- What are their motivations? Are their actions driven by economic dependency (livelihood) or economic advantage? Are these resources replaceable by other resources? Do they have legal jurisdiction over the use of the resource and regulate its use for conservation, economic development or another purpose? Are they working to conserve the resource? Have they conducted research on the resource?
- What is the feasibility of changing their behaviour?

Example of a Complete Situation Model

Below is an example for a complete situation model for a mountain village in Central Asia that mainly depends on livestock husbandry (with high mountain pastures in summer and lower pastures around the villages in winter and spring, with some hay meadows), irrigated orchards and agricultural fields. Riparian forests along a glacier-fed river and juniper forests are also used for resources, or have a key buffering function. The community is subject to natural disasters due to avalanches, landslides, flash floods and mudflows, against which it is protected by upstream forests. Climate change increases the risk of natural disasters and adds to the degradation of ecosystems by the conventional threats listed in the situation model. Some of the contributing factors represent intervention points for various adaptation interventions to reduce the vulnerability of this community.

FIGURE 25. COMPLETE SITUATION MODEL FOR ECOSYSTEMS AROUND A MOUNTAIN VILLAGE IN CENTRAL ASIA



To see the specific linkages between ecosystem targets, ecosystem services and human wellbeing targets, see Figure 8.

Step 8. Re-evaluate Project Scope and Targets and Set Goals

Re-evaluate Scope and Targets

Having completed all of the previous steps in the process, the team now has a much better understanding of the conventional and climate threats to the ecosystems (and sometimes species) that support people in the project area. Now is a good time to take a step back and make sure that these ecosystems are likely to persist in the project area over the long term.

We suggest that the planning team review the following elements of the project:

1. Ecosystem and species targets – you may need to revise your ecosystem targets or, in some cases, even consider removing an ecosystem target
2. Scope – evaluate the need for changes in the project's thematic scope, as well as geographical scale and boundaries
3. Key ecological attributes and indicators – look to add climate-vulnerable key ecological attributes or climate-related early-warning indicators

Perhaps no changes will be necessary, but this is a good point to re-evaluate what the project is working to conserve. Once you have done this, you should use the KEAs and indicators defined in Step 3 to set goals for your ecosystem targets.

How to Re-evaluate Scope and Targets and Set Goals

1. Re-evaluate Your Scope and Targets

To re-evaluate your ecosystem targets, you should ask questions such as:

- Will the ecosystem targets still be viable in the project area in 50 years?
- Will it be possible to conserve the original ecosystems or might the area be shifting to different types of ecosystems and species?

Based on your answers to these questions, your project team may decide to adjust your ecosystem targets to incorporate the natural cover that is likely to be present under all likely climate scenarios, or to adjust your geographical scope. If you are working to conserve species that are likely to go extinct, you may want to discuss whether to keep them as full targets or include them as nested targets within another ecosystem target. These are not easy discussions to have, but they are important.

2. Use the Viability Assessment to Define the Desired Future Levels of Each Indicator

The Conservation Standards define a **goal** as "a formal statement detailing the desired impact of a project, such as the desired future status of a target."

TABLE 7. EXAMPLE VIABILITY ASSESSMENT FOR ALPINE AND SUBALPINE GRASSLANDS

			Indicator ratings			
Ecosystem target	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**
Alpine and subal-pine grasslands	*General grass-land condition*	*Pasture degra-dation index of Etzold & Neudert (2013)*	< 33%	34-67%	68-84%	> 84%
Current rating				X		
Desired future rating					X	
Alpine and subal-pine grasslands	*Available intact grassland area (ha)*	*Grassland area (ha.) according to remote sensing date*	< 350	350-500	500-750	> 750
Current rating			X			
Desired future rating					X	
Alpine and subal-pine grasslands	*Nutritiousness of fodder*	*% coverage of non-edible, grazing re-sistant plant species*	> 20%	10-20%	5-10%	< 5%
Current rating			X			
Desired future rating				X		

They further state that "a good goal meets the criteria of being specific, measurable, achievable, results-oriented, and time-limited (SMART)." Up until now, your team has not set specific desired goals for your ecosystem and species targets. During the viability assessment step, you selected key ecological attributes, identified indicators, and provided current ratings for those indicators. Now you should have enough information to define the goals for your (potentially reconsidered) ecosystems and species, by specifying the future desired levels of those indicators. This may not be an easy step. Consider first drafting goals that you can improve iteratively over time.

To define quantitative or qualitative goals for each of your ecosystem targets, begin by defining the desired level for each of the indicators for the KEAs defined in the viability assessment (see example in Table 7). The basic question is: what level of the KEAs will allow the ecosystem targets to persist into the foreseeable future, even in the face of climate change? The answer to this question may be different than it would have been before you assessed the potential impacts of climate change. The team will have to use their best judgement. Do not be surprised if, during the course of discussion, the team decides to change KEAs or even ecosystem targets.

3. Use the Desired Future Levels of Each Indicator to Develop Goal Statements

For each ecosystem target' develop one or more goal statements that incorporate the desired future levels of the indicators that you defined to measure your KEAs. You will need to define a timeframe for the goal (usually 10 years or more). In our alpine and subalpine grassland example, the team could develop separate goals for each KEA or (as shown here) define one goal that incorporates the desired future levels of the indicators for all three of their KEAs:

> *By 2030, there are more than 500 hectares of alpine and sub-alpine grasslands in the project area and at least 70% of these grasslands are in good condition, according to the Etzold and Neudert (2013) pasture degradation index, and contain no more than 20% coverage of non-edible, grazing resistant plant species.*

Example of Re-evaluation, Changes Made and Goals

Let us consider a team in Central Asia working to conserve and sustainably use an area that includes a floodplain forest containing a poplar species (*Populus pruinosa*), a near threatened species on the IUCN Red List that is used by local inhabitants for fuel wood in winter. Originally, the team wanted to restore the floodplain forest containing desert poplar to over more than half of the area within 100 meters of the river. A few factors have made this challenging, however:

- A hydroelectric dam has been installed. It has been operated in such a way that most downstream discharge has been in winter, outside of the growing season. This has dried out what had previously been floodplain forest, reducing the area in which desert poplar could grow.
- The regulation of water for agricultural development has caused most riparian forests to miss necessary flooding cycles and consequently suffer from overly dry and salty conditions.
- The climate has gotten hotter and drier, which has increased evapotranspiration.
- Glaciers in the upper portion of the watershed have been melting, which has also contributed to drying out the floodplain forest area.
- Some of the floodplain forest has been replaced by dry Tamarisk vegetation.

When re-evaluating their scope and targets, the team decided to narrow the scope of their project to exclude areas that are not likely to have enough moisture to support floodplain forest in the future, because of the dam, projections of decreases in precipitation, or both. They also changed their ecosystem target from the desert poplar floodplain forest (which requires more moisture) to a more general vegetation type, such as a "functional tugai floodplain forest," which can be composed of poplars (*Populus diversifolia, P. pruinosa*), dzhidda (*Elaeagnus oxycarpa*), willows (*Salix* spp.), and tamarix (*Tamarix* spp.) forests, along with reeds. Because of changes in the hydrology of their area and expected shifts in the range of the desert poplar, the team used their viability assessment (see Table 8) to define the following as a realistic, achievable ecosystem target goal:

By 2030, within the project scope more than 50% of the area within 50 meters of the river is functionally intact Tugai floodplain forest and less than 2% of the forest is non-native, invasive species.

Step 8.

TABLE 8. EXAMPLE OF USING A VIABILITY ASSESSMENT TO ESTABLISH ELEMENTS OF A GOAL

			Indicator ratings			
Ecosystem target	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**
Functional Tugai flood-plain forest	*Area of flood-plain forest*	*% of the area within 50 meters of the river that is forested*	< 25%	25-50%	51-75%	> 75%
Current rating				X		
Desired future rating					X	
Floodplain forest	*Native species composition*	*% of area occupied by non-native, invasive species*	> 5%	2-5%	< 2%	none
Current rating				X		
Desired future rating					X	

Step 9. Identify and Select Adaptation Interventions

Identify and Select Adaptation Interventions

Now that you have defined your project scope, what you are trying to conserve (ecosystem and human well-being targets), what is affecting the health of your targets (conventional and climate threats and contributing factors), and what you are trying to achieve (goals), you are prepared to identify and select effective adaptation **interventions**. We distinguish between five different types of adaptation interventions:

1. Threat abatement interventions
2. Stress mitigation interventions
3. Viability enhancement or restoration interventions
4. Ecosystem service management interventions
5. Livelihood change and human well-being enhancement interventions

1. Threat Abatement Interventions

This type of adaptation intervention decreases climate-related stresses by reducing a conventional threat that exacerbates climate impacts. In our example (see Figure 26), the hydrology of mountain meadows is altered by diversion of water for municipal water use and irrigation (a conventional threat) and increased snow melt (a climate threat). Promoting water conservation helps decrease the diversion of water for municipal use and thus reduce the stress of altered hydrology. As is usually the case, in this example it is not possible to reduce the climate threat (increased snow melt), but it is possible to reduce the stress by reducing the conventional threat (water diversion).

2. Stress Mitigation Interventions

Stress mitigation interventions aim to directly reduce the stresses on ecosystem targets caused by conventional and climate threats. This is often done by creating artificial conditions that allow the ecosystem to adapt. In our mountain meadow example, snow melt and diversion of water for municipal use reduce the moisture available to the meadows during the dry season. To mitigate this stress, the team could store water (in large tanks designed to fulfill the function of glaciers) and release it onto the meadows during the dry season, to maintain ecological flows.

3. Viability Enhancement Interventions

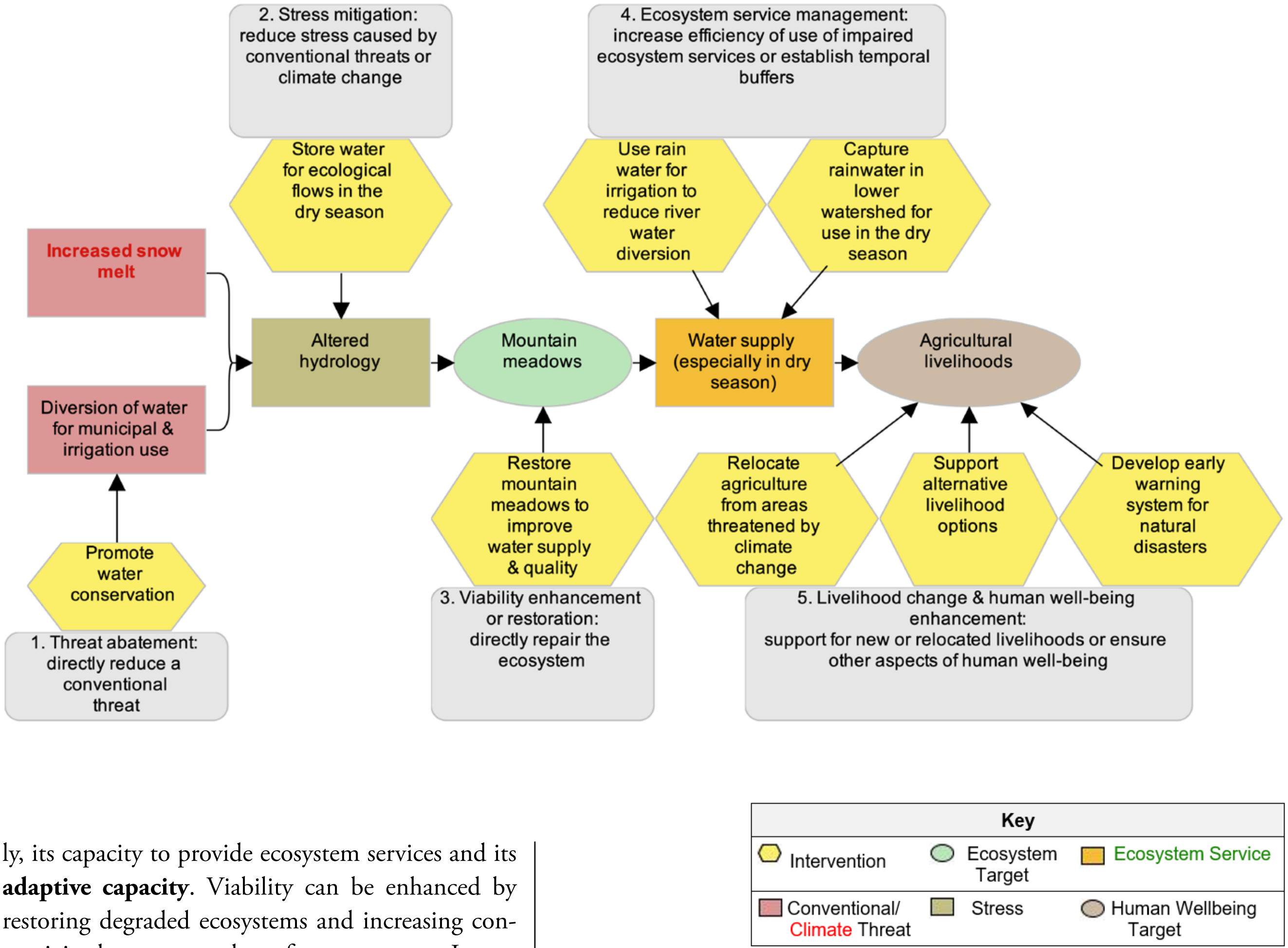
Viability enhancement interventions directly improve the health of the ecosystem target and, consequent-

KEY TERMINOLOGY

ADAPTIVE CAPACITY: a measure of the ability of a system or species to adjust to climate change impacts with minimal disruption.

TEMPORAL BUFFER: An outcome from an intervention that corrects for seasonal mismatches caused by climate change.

FIGURE 26. DIFFERENT TYPES OF ADAPTATION INTERVENTIONS



ly, its capacity to provide ecosystem services and its **adaptive capacity**. Viability can be enhanced by restoring degraded ecosystems and increasing connectivity between patches of an ecosystem. In our example, mountain meadows that are in good condition store water in the spring, as snow melts, and release cool flows in the summer. Meadow grasses and soil also filter out pollutants and sediments. Restoring vegetation cover and community structure of mountain meadows can improve water supply and water quality and increase the capacity of the ecosystem to adapt to changes in precipitation patterns.

4. Ecosystem Service Management Interventions

These interventions support human adaptation to climate change through more efficient and wiser use of ecosystem services that have been impaired by climate change. In our example, communities depend on water for irrigation, especially during the dry season. Over the long term, the melting of glaciers will reduce water availability during the dry season. Ecosystem service management interventions can involve more efficient resource use (e.g. drip irrigation) or capturing and storing rainwater to use for irrigation, instead of water from streams. The latter approach establishes a **temporal buffer**, helping to make water available when it is needed for livelihood activities. Climate change often causes seasonal mismatches between ecosystem service availability and livelihood needs, which can be addressed with this type of intervention.

5. Livelihood change and human well-being enhancement interventions

In those cases where none of the adaptation interventions mentioned above have the potential to help people adapt their current livelihoods to the changing circumstances, you may have to consider interventions that either provide alternative places to practice the current livelihood or help communities transition to other income-generating activities with a similar standard of living. In our example, communities could relocate their agricultural areas or develop alternative sources of income. Small business ventures such as building greenhouses, manufacturing clothing or crafts, or creating fish ponds can decrease communities' economic dependence on grazing and agriculture.

This category also includes interventions that enhance other aspects of human livelihoods, aside from income. For example, developing early warning systems can help protect people from natural disasters, such as flooding and landslides caused by extreme weather events.

How to Identify and Select Adaptation Interventions

1. Use your situation model to brainstorm potential adaptation interventions

Good adaptation interventions should be linked to specific factors in your situation model. Use your situation model to identify problems that need to be addressed and specify which factors in the model you need to change and could change through adaptation interventions – these are your "key intervention points." Consider the different types of interventions described above and where it makes most sense to act (e.g., on a conventional threat, contributing factor, stress, ecosystem target, ecosystem service or human well-being target). Begin your intervention with a verb (e.g., strengthen law enforcement, improve regulations, build awareness, conduct research, restore forest cover) describing a focused course of action that will respond to the selected factor in your situation model.

Brainstorm potential interventions to influence key intervention points. Brainstorming means thinking outside of the box and considering different approaches to resolving the issue. Use all of the work you have done in previous steps and consider innovative solutions – not simply continuing what you have always done. It often helps to put yourself into the shoes of the stakeholder who is eventually going to be affected by the interventions you are developing. Building on your initial brainstorm, take a step back to see the bigger picture and play around with different ideas and combinations of interventions to build an overall strategic approach that you are convinced can deliver on the desired impact.

Hint: This process is in many ways comparable to the creative process in design thinking (cf. Kumar 2012).

2. Ensure that your interventions are not maladaptive under specific climate scenarios and give priority to those that provide co-benefits

It is important to evaluate whether each of your potential interventions will be effective under all of the climate scenarios that your team has considered important. If an intervention will be effective under all scenarios, then it can be considered "climate-robust." If it is harmful under some scenarios, we consider it "maladaptive." It is also possible for an intervention to be effective under some but not all scenarios, without causing damage in the others. Determine which of the following categories each of your interventions fits in:

1. **"Climate robust"** – Interventions that will be effective under all climate scenarios. For example, regenerative agriculture techniques increase the health of the soil and can increase resilience to either very wet or very dry conditions.
2. **"Sometimes effective"** – Interventions that will only be effective under some scenarios but will not be "maladaptive" (cause harm to ecosystems or communities) under any climate scenarios.

For example, drip irrigation can decrease the impact of drought on agricultural areas but will not be helpful – or harmful – if precipitation increases, because it is possible to turn the irrigation system off during wet periods.

3. **"Maladaptive"** – Interventions that cause harm to human or ecological systems, i.e. that foster adaptation in the short-term but insidiously affect systems' long-term capacity to adapt to climate change. For example, helping ranchers change their livelihoods from grazing to irrigated agriculture may help them to adapt to increased drought in the short term, but it also increases diversion of water from rivers and streams, causing them to dry up for longer periods.

Continue to consider interventions that are climate robust, eliminate those that you categorize as maladaptive, and decide whether it is worthwhile to invest in interventions that will be effective under some scenarios but not others. In our example project, the team considered several potential interventions for improved economic sustainability - and hence better adaptation capacity of the community. One intervention under consideration was the strengthening of local value chains for increased profit from local irrigated garden produce through processing, packaging and marketing. However, this possible intervention was abandoned in light of the likely future increase in extreme summer heat events, which would almost inevitably lead to strong harvest losses of these already marginal crops. Increased economic dependence on these crops would have been maladaptive in the medium and long term.

Some interventions provide **co-benefits** that go beyond the intervention's contribution to climate change adaptation. These can include more sustainable natural resource management or short-term economic benefits that may increase stakeholder support for an adaptation intervention. In our example, the team considered different possible interventions to stabilize river banks, prevent erosion, and mitigate the effects of floods. Potential interventions included either reforesting river banks or installing gabions (wire cages filled with rocks, concrete or riprap). The gabions would reduce erosion right away, whereas the trees would take some time to grow. However, depending on what species of trees were used and where they were planted, they could also provide fruits or nuts, shade to keep the streams cooler, or fodder for livestock – all important co-benefits for the community. The team decided that reforestation would be a better solution than gabions.

3. Compare possible interventions and select your final set of adaptation interventions

If you take your brainstorming seriously, you will usually end up with a whole suite of possible interventions – more options than you can realistically implement. You should compare the different possible interventions according to criteria such as the following:

- effectiveness or potential impact of the intervention in reducing threats, conserving or restoring ecosystem targets, or enabling adaptation of people's livelihoods
- technical and social feasibility of implementing the intervention
- feasibility of obtaining the financial resources needed to implement the intervention
- cultural appropriateness
- urgency
- extent to which this intervention fills a niche not filled by the interventions implemented by others

You can simply have a discussion, loosely using criteria such as these to compare different interventions and decide which ones to implement. We find it very useful, however, to rate potential interventions. We have included definitions for three key criteria (potential impact, technical and social feasibility, and financial feasibility) in Box 15. Feel free to add more criteria if needed. Rating each potential intervention based on a clearly defined set of criteria can generate interesting discussions and help you to select those interventions that will most effectively and efficiently accomplish your goals.

Table 9 provides an example of a relative ranking of interventions. Beginning with the first criterion of potential impact, the team compared the interventions to one another, determined which one would have the highest potential impact, and gave this intervention a "9," because they were comparing nine interventions. They assigned a "1" to the intervention that would have the lowest impact. They compared the degree to which each intervention could reduce a threat, conserve or restore an ecosystem target, or contribute to adaptation of people's livelihoods. They ranked an intervention higher if it addressed a higher threat and if it would have a tangible, measurable impact. When assessing the technical and social feasibility of each intervention, the team took into account the technical difficulty of the intervention and the availability of relevant experience. After applying each of the three criteria, the team calculated the total scores and discussed the results.

The relative rating is a tool to support decision-making but the group must discuss the results and make the final decision about which interventions to implement. Do not give too much importance to the final numbers. The discussion is more important than the rating itself. In our example, the team had a strong argument for implementing an intervention that received a lower rating. They decided that the community was very concerned about flooding and landslides and definitely wanted to analyze the risk of extreme events and assess options for early warning systems, even though it was rated lower than other interventions.

TABLE 9. EXAMPLE RATING OF POTENTIAL INTERVENTIONS

Potential Interventions	Type of Adaptation Intervention	Criteria for Ranking Interventions			Total Score
		Potential Impact	Technical & Social Feasibility	Financial Feasibi-lity	
A. Conduct afforestation in areas prone to landslides	Stress mitigation	4	7	8	19
B. Strengthen community forest management	Threat abatement	8	6	4	18
C. Build capacity for sustainable community pasture management	Threat abatement	9	4	5	18
D. Improve irrigation canals & pipes to decrease water loss & address insufficient irrigation	Threat abatement	1	5	1	7
E. Encourage use of energy efficient, clean cookstoves & provide microcredit	Threat abatement	7	9	7	23
F. Conduct reforestation to stabilize river banks, prevent erosion & mitigate floods	Viability enhancement	5	8	9	22
G. Improve water storage, management & conservation	Ecosystem service management	6	2	3	11
H. Analyze risk of extreme events & assess options for early warning systems	Livelihood change and human well-being enhancement	3	3	6	12
I. Support establishment of tourism businesses through training & microcredit	Livelihood change and human well-being enhancement	2	1	2	5

CRITERIA FOR RATING ADAPTATION INTERVENTIONS

BOX 15.

Potential Impact – Degree to which the intervention (if implemented) will lead to desired changes in the situation, including threat reduction, conservation or restoration of ecosystem targets, and/or adaptation of people's livelihoods

- *Very High* – The intervention is very likely to completely mitigate a threat, restore a target or ensure effective adaptation of people's livelihoods.
- *High* – The intervention is likely to help mitigate a threat, restore a target or ensure effective adaptation of people's livelihoods.
- *Medium* – The intervention could possibly help mitigate a threat, restore a target or support adaptation of people's livelihoods.
- *Low* – The intervention will probably not contribute to meaningful threat mitigation, target restoration, or livelihood adaptation.

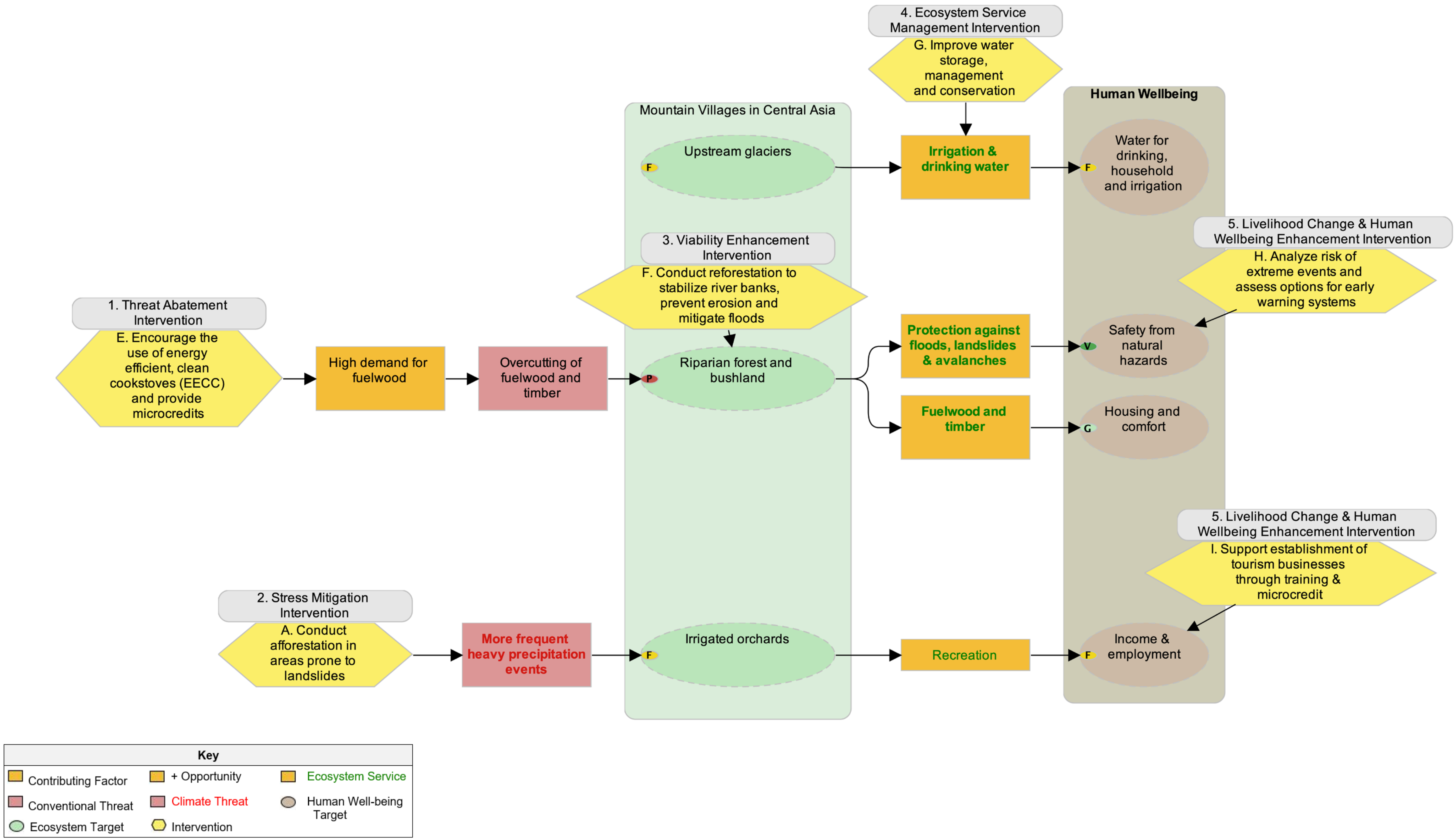
Technical and Social Feasibility – Degree to which your project team could implement the intervention within likely time, staffing, ethical and other constraints. This generally depends on the ease of implementation of the intervention, the availability of a lead institution with relevant experience, and an ability to motivate key constituencies whose involvement is needed for success.

- *Very High* – The intervention is technically feasible and socially acceptable, a lead institution has the time, talent and relevant experience to implement it, and it is feasible to motivate key constituencies whose involvement is needed for success
- *High* – The intervention is socially acceptable, but may require some additional technical expertise or stakeholder involvement for successful implementation
- *Medium* – The intervention is either technically difficult or lead institutions do not have the relevant experience or it is hard to involve key constituencies needed for success
- *Low* – The intervention is either not technically feasible or not socially acceptable

Financial Feasibility – Cost of the intervention and feasibility of obtaining the financial resources necessary to implement it

- *Very High* – The intervention is very financially feasible. It may have a low cost, an institution may already have the resources to implement it, or it may be possible to obtain the necessary financial resources
- *High* – The intervention is financially feasible, but may require some additional financial resources
- *Medium* – The intervention is financially difficult without substantial additional resources and/or it is difficult to obtain the necessary financial resources
- *Low* – The intervention is very expensive and/or it is very difficult to obtain the necessary financial resources

FIGURE 27. CENTRAL ASIAN EXAMPLE INTERVENTIONS



Step 10. Develop Theories of Change & Monitoring Plan

Use Results Chains to Depict Your Theory of Change

Once you have selected your interventions, you should clarify your assumptions about how each intervention will help you achieve your adaptation goals – this is your **theory of change**. A **results chain** is a tool that depicts these assumptions in a causal ("if-then") progression of expected short- and medium-term intermediate results that represent how you believe your activities will lead to long-term ecosystem-based adaptation **results**. For EbA projects, the results chain shows how specific interventions will lead to the desired changes in the viability of ecosystems and provision of ecosystem services that will help the community adapt to climate change. The tool also shows the temporal sequence of expected results and can help you estimate how much time it will take to reach your ultimate results. Finally, it can be used to check the project logic at the design stage and retrospectively during monitoring and evaluation.

Use your situation model as the basis for developing your results chains. Doing so helps you explicitly show how your intervention will affect the "current state of the world" (portrayed in your situation model), allowing you to achieve the "desired state of the world" (portrayed in your results chain).

KEY TERMINOLOGY

THEORY OF CHANGE: A clear set of assumptions about how you think your intervention(s) will help you achieve both intermediate results and longer-term conservation and human well-being goals. Your theory of change can be expressed in text, using a diagram, or through other forms of communication.

RESULT: The desired outcome of an adaptation measure, part of a results chain. There are threat reduction results, restoration results and other ultimate desired results (at the end of the results chain) on the one hand, and intermediate results (in between the intervention and the ultimate desired results) on the other hand.

RESULTS CHAIN: A graphical depiction of a project's core assumption, the logical sequence linking project interventions to one or more targets. In scientific terms, it lays out hypothesized relationships.

Cross referencing your results chains with your situation model also encourages the team to consider how external factors will impact the desired results and if a single intervention is sufficient or additional interventions are needed to influence a contributing factor, reduce a threat, or restore an ecosystem. We strongly encourage peer review of results chains in order to tease out unconscious, implicit and potentially wrong assumptions on the part of the core team.

How to Develop a Results Chain

1. Select a priority intervention

Starting with your simplest intervention, use your situation model to identify all the drivers and conventional threats (and possibly stresses) that the intervention will influence.

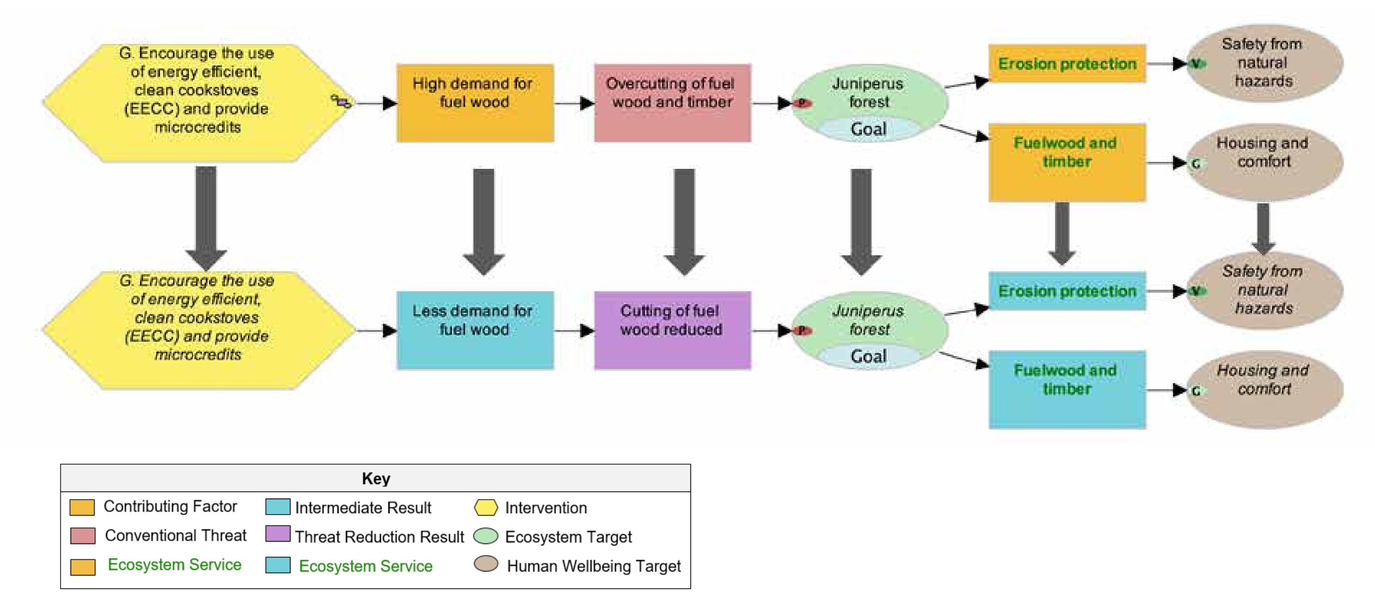
2. Draft an initial results chain

Reword the threat as a threat reduction result and change the wording of the contributing factors you identified to make them results. Contributing factors are neutral (e.g., government forestry policies) or negative (e.g., weak institutional capacity), whereas results are stated as positive outcomes (e.g., strengthened capacity to enforce forestry regulations). The results should reflect the changes you want to see in the factors once your intervention is in place. In our example situation model, the team proposed an intervention to encourage the use of energy efficient, clean cookstoves and provide microcredit to help people obtain them (see Figure 28). In the situation model, this intervention would influence the high demand for fuel wood, which contributes to overcutting of fuel wood and timber. The team created an initial results chain by flipping the factors from the situation model into results. "High demand for fuel wood" became "Less demand for fuel wood" and "Overcutting of fuel wood and timber" became "Cutting of fuel wood reduced" (because the intervention would reduce fuel wood harvest but not timber harvest).

3. Add results and activities needed to complete the links in the results chain

The next step is to add all the intermediate results necessary to create clear, logical "if…then" linkag-

FIGURE 28. AN EXCERPT OF A SITUATION MODEL TURNED INTO AN INITIAL RESULTS CHAIN



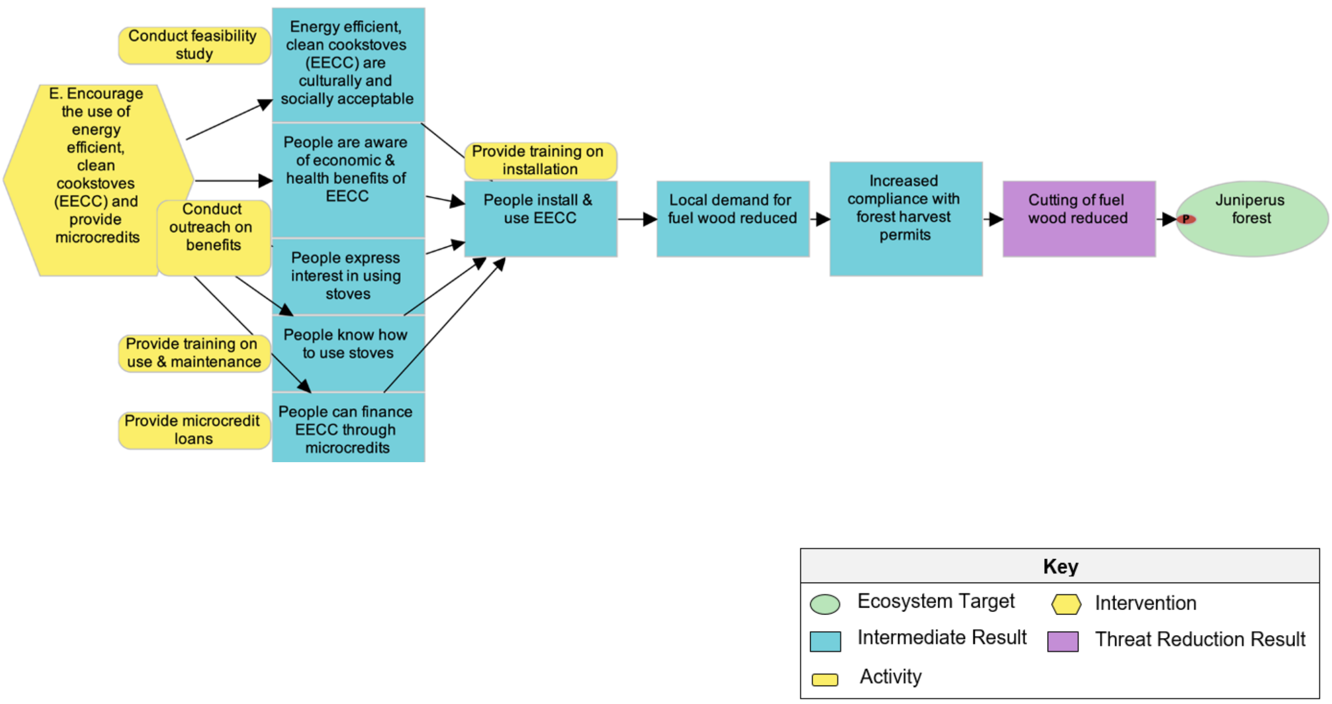
BOX 16.

THE IF...THEN TEST

The IF...THEN test is a central part of results chain analysis. It consists of first formulating the relationship between two factors in the initial draft results chain as though it were purely causal ("IF a pasture rotation system is established, THEN grazing pressure will be reduced"). In the next step, this assumed causal relationship is questioned: Is it really sufficient or are additional factors needed so that the result is ensured ("IF a pasture rotation system is in place AND IF all pastoralists follow it, THEN grazing pressure will be reduced")? If the latter is the case, the additional factors are added as assumptions. The team then asks if it can be safely assumed that these assumptions will be in place, or if additional measures are needed to ensure they are. If they are, these are added to the results chain as auxiliary measures.

es along the chain. This is the most difficult step and there are several different ways to approach it. You can brainstorm intermediate results and then organize them along the chain, assuring that there are clear "if...then" linkages between each pair of results. If you have experience applying the intervention, however, we recommend that you work from left to right, asking what the immediate results or outcomes of the intervention should be, what intermediate outcomes those results will in turn produce, and what additional outcomes are necessary to reduce your threat. If you are developing a new intervention for a threat that you have not addressed in the past, then it is generally better to work from right to left, asking what needs to happen to enhance the viability of the ecosystem, increase ecosys-

FIGURE 29. NEXT DRAFT OF RESULTS CHAIN FOR ENERGY EFFICIENT COOKSTOVES, WITH ACTIVITIES



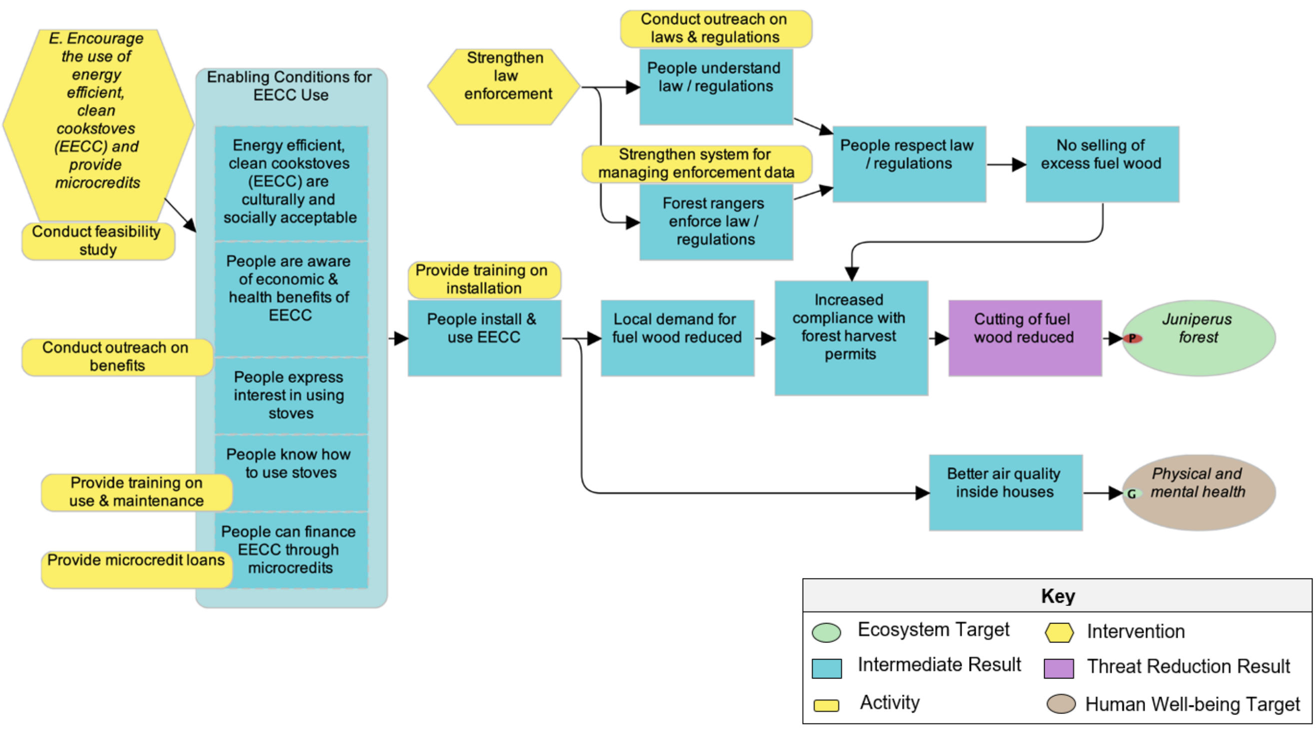
tem services, and reduce the threat, what outcomes are needed to make that happen, etc. This will help you refine the focus of your intervention.

To complete the results chain, the team started by adding the result, "People install and use energy-efficient, clean cookstoves." They used the if... then test to think about all of the enabling conditions needed to achieve installation and use of the stoves and added these results to the left: cultural acceptability of the stoves, awareness of the benefits, interest in using them, knowing how to use them, and access to credit. Finally, the group discussed the connection between reduced demand for fuel wood and increased compliance with forest harvest permits. Each portion of the chain required quite a bit of discussion about which results would lead to achieving which others.

While you work on building your results chain with your team, it is very likely that you will also start to discuss the activities that you need to implement in order to achieve each of the desired results. You may even think of activities that did not occur to you initially. Add these activities as they come up, placing them next to the result they will help you achieve (see Figure 29). Please note that, to make the figures more legible, we have not included ecosystem services and human wellbeing targets in Figures 29, 30 and 33.

After completing this version of their results chain, the team recognized that use of the stoves would contribute to better indoor air quality and physical health. They added these results on the right side of the chain. They also had a long discussion about the need to ensure that local people would not start selling fuel wood from their community's juniper forests in neighboring villages and cities. If they reduced their own use of fuel wood but sold the remaining fuelwood, then use of the stoves would not lead to a reduction in the harvest of fuel wood from the juniper forests. This led the team to add a complementary intervention to strengthen law enforcement and ensure no selling of "excess" fuel wood. Figure 30 shows their final results chain.

FIGURE 30. FINAL RESULTS CHAIN FOR ENERGY EFFICIENT COOK STOVES WITH ACTIVITIES



4. Verify that the results chain meets the criteria for a good results chain

A good results chain should meet the criteria in Box 17. In particular, you want to make sure that your results chain is *results oriented*. A common mistake with developing results chains is to list all the activities that your team must undertake to implement your intervention. This produces an implementation chain, not a results chain (see example in Figure 31). An implementation chain does not show the causal logic that connects an intervention to a desired conservation impact. As such, it does not provide you with an idea of the assumptions you need to test in order to know whether your intervention is working or not.

Hint: Reading your chain out loud is a good test of whether the results are "causally linked."

Read the chain from left to right, linking each pair of results with an "if...then" statement. Start by saying, "If we implement X intervention, then we will achieve Result A. If we achieve Result A and we implement activity a, then Result B will occur…" This will help you test your logic. If an "if…then" linkage seems like a leap of faith, you may need an additional assumption (intermediate result and/or activity) to make a stronger causal link. In some cases, you may even need an additional chain of results to link into the main chain, as in the case of the law enforcement chain added to the cookstove chain above, in Figure 30.

CRITERIA FOR A GOOD RESULTS CHAIN

BOX 17.

- *Results oriented* – Boxes contain desired results (e.g. reduction of hunting), not activities (e.g. conduct a study).
- *Causally linked* – There are clear connections of "if…then" between each pair of successive boxes.
- *Demonstrates change* – Each box describes how you hope the relevant factor will change (e.g. improve, increase, or decrease).
- *Reasonably complete* – There are sufficient boxes to construct logical connections but not so many that the chain becomes overly complex
- *Simple* – There is only one result per box.

5. Include climate stresses in the results chain (optional)

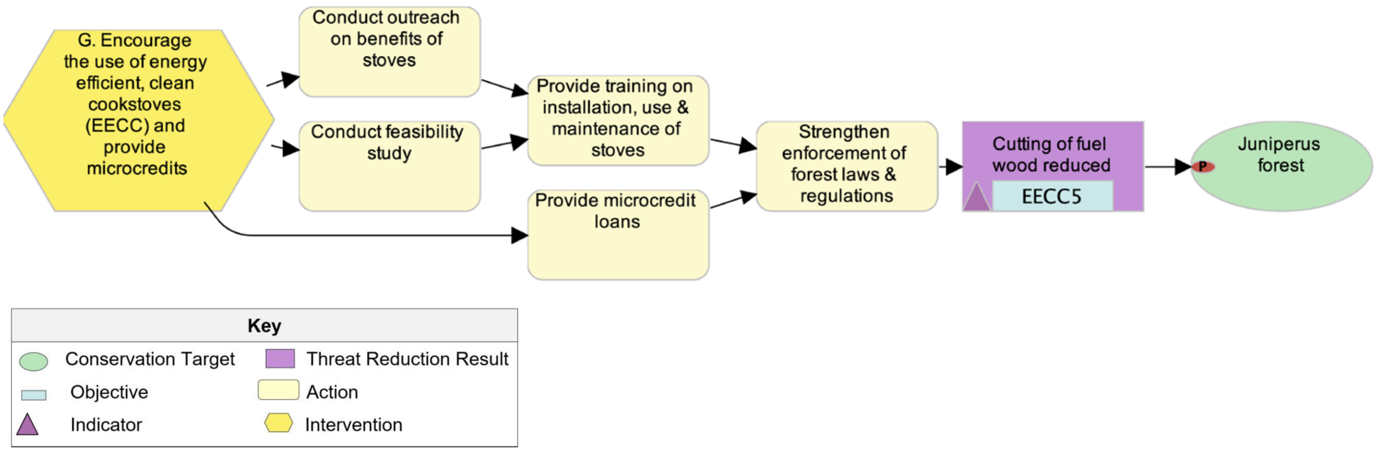
Part of your team's theory of change is that your interventions will successfully reduce the vulnerability of human communities to climate change by conserving or restoring ecosystems. To show this graphically, sometimes it is helpful to include specific climate stresses (that you may have included in your situation model), such as increased air or water temperature, changes in precipitation, or increased frequency and intensity of storms. Keep in mind that you will <u>not</u> be able to reduce these climate stresses. Including them in your theory of change means that you believe that your intervention will be successful *in spite of* these climate stresses.

In our example (see Figure 32), climate scientists believe that snowpack will decrease in a montane area. The community, concerned about limited water availability during the hot summer months, develops an intervention to improve water storage, management and conservation. Their assumption is that improving water management will ensure that farmers have access to water for irrigation throughout the summer, even in the face of decreased snowpack, which influences the baseflow of the streams in the summer. In this case, their results chain includes "decreased snowpack" (not as a desired result, but rather as a change that the team cannot avoid – for this reason it is in red text) and shows how their intervention will reduce the community's vulnerability to this change.

6. Identify key results and add objectives

Now that you have developed your results chain, your team can use it as a tool to set short-term objectives to ensure you are on track for long-term out-

FIGURE 31. EXAMPLE OF AN IMPLEMENTATION CHAIN

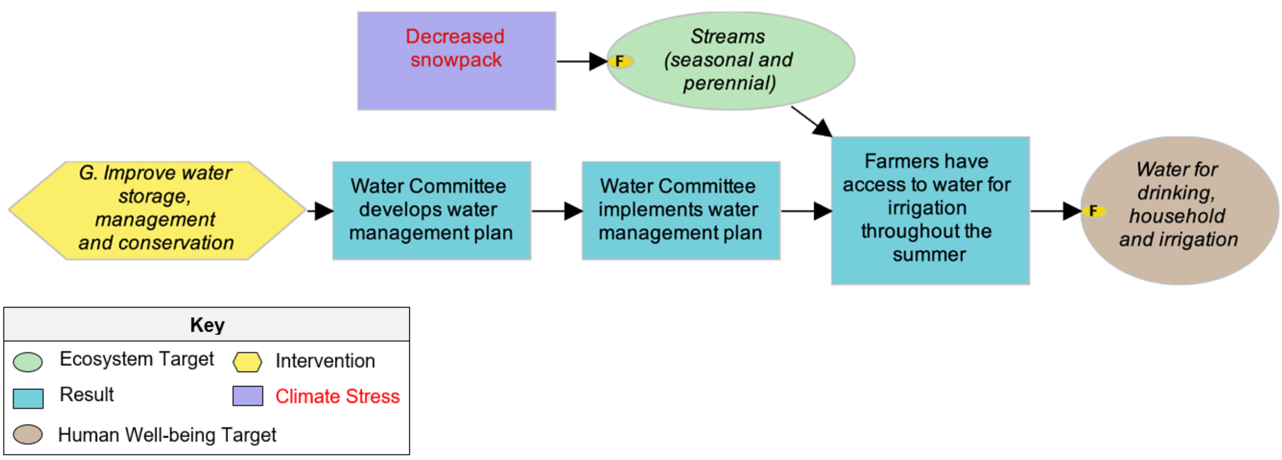


comes. An **objective** is a formal statement detailing a desired outcome of a project, such as reducing a critical threat or decreasing vulnerability to climate change. Like goals, good objectives meet "SMART" criteria of being *specific, measurable, achievable, relevant,* and *time-limited* (Box 18). If the project is well conceptualized and designed, realization of a project's objectives should lead to the fulfillment of the project's goals.

Your team should monitor each objective to make sure that the intervention is having the desired outcome. So that teams do not become overwhelmed by monitoring efforts, you should create objectives for only the *most important results* in your results chain. To start, create an objective for your threat reduction result as you will always need to understand if the threat is increasing or decreasing. This will be informed – at least in part – by the goal you have set for your ecosystem target. Then select at least one critical short-term result and at least one critical medium-term result (at the beginning and middle of the chain, respectively) that you feel you must achieve and that will allow you to measure whether things are on track. Keep in mind that objectives should be placed on results that can be measured. Some results are easier to measure than others. For example, you may believe that a change in attitudes will lead people to adopt more sustainable practices, but it is easier and more reliable to measure the adoption of more sustainable practices.

You will need to work through each objective to define what is appropriate and to ensure that the

FIGURE 32. EXAMPLE OF A RESULTS CHAIN THAT INCLUDES A CLIMATE STRESS



BOX 18.

CRITERIA FOR GOOD GOALS AND OBJECTIVES

- *Specific* – Clearly defined so that all people involved in the project have the same understanding of what the terms in the goal or objective mean
- *Measurable* – Definable in relation to some standard scale (numbers, percentage, fractions, or all/nothing states)
- *Achievable* – Practical and appropriate within the context of the project site, and in light of the political, social and financial context (especially relevant to objectives, goals may be more aspirational)
- *Results-Oriented* – Represents necessary changes in target condition, threat reduction, and/or other key expected results
- *Time Limited* – Achievable within a specific period of time, generally 1-10 years for an objective and 10-20 years for a goal

criteria for good objectives are met. This is often an iterative process that requires revisiting, refining, and clarifying objectives over time. Where relevant, your objectives should be clear about the target stakeholder and the desired behavior change (e.g., 90% of local farmers adopt more sustainable grazing practices).

The goals and objectives specified in your results chain represent what you need to accomplish and your assumptions about how your interventions will help you achieve it. As such, these results chain components become the ultimate measure against which you will gauge the progress of your project. The results chain with its associated objectives and indicators represents the backbone for the further planning, monitoring and learning from each planned EbA measure.

7. Define indicators for monitoring progress along your results chain

You will need at least one indicator for each objective on your results chain (see example in Table 10 and Figure 33). Make sure that your indicators meet the criteria in Box 19 and make any necessary revisions. To make the best use of your team's resources, try to limit the number of indicators to only those necessary to monitor your progress. If your objectives are specific and measurable, identifying the indicator should be straightforward.

As you develop your indicators, you will also need to think about *how* you will measure them – in other words, what methods you will use. Methods should be *accurate, reliable, cost-effective, feasible,* and *appropriate*. The key is to select the most cost-effective method that will give you data reliable enough to meet your management needs. For many information needs, you may not have to collect new data specific to the project. For example, one method for collecting data about land cover would be to download land use / land cover maps that are available online. In some cases, however, primary data collection will be required. Table 11 shows a detailed monitoring plan that includes monitoring methods, the baseline level of each indicator, the desired level of the indicator, frequency of measurement, and who is responsible for measuring the indicator.

Goals for ecosystems and human well-being targets, to which EbA measures contribute, are typically long-term (often in excess of 10 years) and may exceed typical project lifespans. This needs to be reflected in the monitoring, where often only modest progress can be detected by the end of a particular grant period. Earlier progress can usually be observed by measuring objectives tied to intermediate results in your results chain.

In developing your monitoring plan, it is best to test and adjust indicators and methods before using them. For example, you should pilot test survey instruments to ensure they give you the data you need and are not subject to misinterpretation. Likewise, collecting baseline data early could be a way of testing your methods. If you cannot establish baselines within the first few months of a project, then most likely you need to revise the methods or the indicators.

TABLE 10. OBJECTIVES, GOAL AND INDICATORS FOR COOKSTOVE RESULTS CHAIN

Result	Objective	Indicator	Monitoring Methods
People install & use energy efficient, clean cookstoves (EECC)	Objective 1. One year after introduction, 75% of the households in the village use EECC for all of their cooking.	% of the households in the village that use EECC for all of their cooking	project statistics (EECC user agreements) and village survey conducted at the end of year 1
People understand law / regulations	Objective 2. Two years after introduction of EECCs, more than 90% of adults in the village are aware of forest regulations and the rationale behind them.	% of adults in the village who are aware of forest regulations and the rationale behind them	village survey conducted at the end of year 2
No selling of excess fuel wood	Objective 3. Two years after introduction of EECCs, no fuel wood from the village's forests is sold in nearby villages and cities.	# of cubic meters of fuel wood from the village's juniper forests that are sold in nearby villages & cities	key informant interviews with people who sell fuel wood in nearby villages & cities
Cutting of fuel wood reduced	Objective 4. Two years after introduction of EECCs, harvest of fuelwood from the juniper forests over which the village has tenure has decreased by 50% and does not exceed the sustainable harvest limit defined in the forest management plan.	# of cubic meters of fuelwood harvested annually from the village's juniper forests	Documented quota per household and random checks of actual removal (cooperation of forest enterprise rangers, village committee and project staff) during Year 2 (and onwards)
Target ecosystem	**Goal**	**Indicator**	**Monitoring Methods**
Juniper forest	By 2030, the cover of juniper forest has increased by at least 5%. Rejuvenation and forest stand density are assessed as good, according to forest inventory criteria and thresholds.	Extent of forest area (in ha), coverage density (in %) and density of 2-year old trees (in trees per ha) of juniper forest under village tenure	Standard forest inventory protocols

8. Share and refine your results chain

As stated above, results chains can help teams to discuss their assumptions openly and either reach agreement on shared assumptions or agree to disagree on certain parts of their theory of change. It is often helpful to share a draft results chain with individuals who are knowledgeable about your site, colleagues who have experience implementing similar interventions, or key stakeholders. They may challenge some of your assumptions and their input will improve the quality of your chain.

Many conservation projects are based on general assumptions that warrant testing. A few common examples include:

- If we increase the income of local communities, then community members will not engage in illegal hunting, overfishing, or other unsustainable practices.
- If people in rural areas understand the impact of climate change, then they will change their practices to reduce their carbon emissions (by planting trees, using regenerative agriculture, conserving energy, etc.).
- If stakeholders engage in participatory planning for protected areas, then they will have greater respect for the resource use regulations in the management plan.
- If people learn about the ecological, economic and climate benefits of sustainable agriculture (including agroforestry systems), they will implement sustainable practices and stop using destructive practices (e.g., intense applications of agrochemicals).

FIGURE 33. COOK STOVE RESULTS CHAIN WITH OBJECTIVES, GOAL, INDICATORS AND MONITORING ACTIVITIES

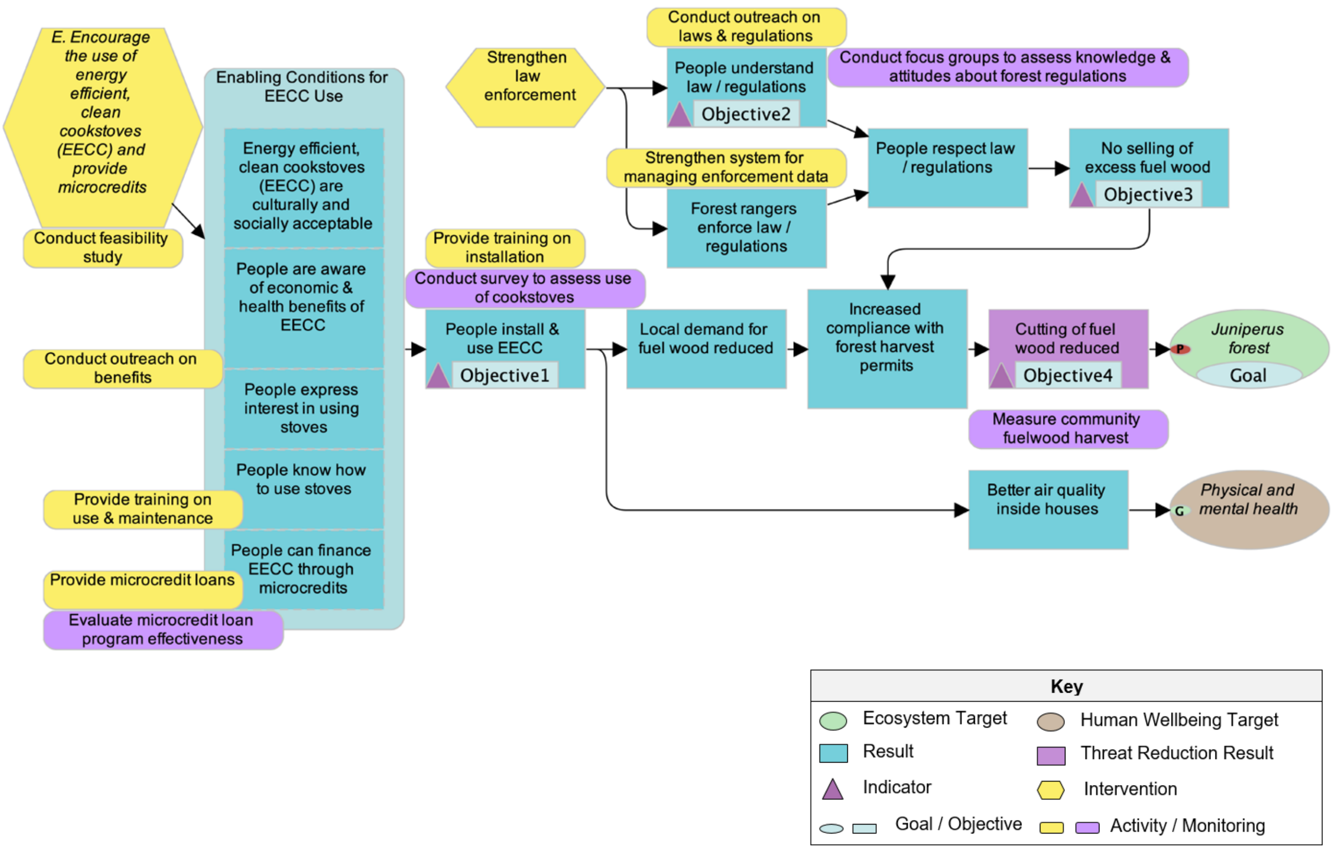


TABLE 11. EXAMPLE OF A MONITORING PLAN FOR A GOAL FOR A PASTURE ECOSYSTEM

Goal: By 2025, the pastures of Khinalug village, Azerbaijan (reference to map) are only weakly degraded, according to established pasture degradation indices.

Monitoring approach: Time series of field measurements, semi-quantitative index

Indicator	Method	Baseline	Desired Level	Frequency	Responsibility
Level of pasture degradation	Pasture degradation index (Etzold & Neudert, 2013)	40*	68*	Once every three years, early and late summer.	Alpine Grassland Conservation Association (national partner NGO)
Available intact grassland area	Grassland area (ha)	< 350	500-750	Once every three years (early summer)	Spatial analysis of remote sensing data
Nutritiousness of fodder	% coverage of non-edible, grazing resistant plant species	> 20%	< 20%	Once every three years	Field vegetation mapping survey

* The pasture degradation index of Etzold and Neudert runs from 0 to 100, with strong degradation reflected by index values below 34 and low degradation by values above 67.

CRITERIA FOR A GOOD INDICATOR

BOX 19

- *Measurable* – Able to be recorded and analyzed in quantitative or qualitative terms.
- *Precise* – Defined the same way by all people.
- *Consistent* – Not changing over time so that it always provides comparable measurements.
- *Sensitive* – Changing proportionately in response to actual changes in the condition or item being measured.

Step 11. Implement Your Adaptation Interventions

Develop a Detailed Work Plan & Budget

Over the course of your project, your efforts should all be tied to your strategic plan through an annual work plan and budget. This step is the culmination of the planning process, where you consider how to allocate your available resources, both human and financial, to implement the activities you identified and achieve the necessary results. Work plans and monitoring plans outline each step of your plan, linking every piece to the resources, capacity, and collaboration with partners that will be needed for implementation.[9] We recognize that every organization has unique policies and guidelines, so you should work within your organization's preferred structure, as long as:

- You use the identified indicators to monitor progress along the theory of change for goals and objectives;
- You make adjustments to the work plan at regular intervals, based on the monitoring results; and
- You seek and document lessons learned from your implementation (e.g. feasibility and effectiveness of certain interventions) and systematically record and share them throughout the EbA community.

9 The guidance provided in this chapter draws heavily from Open Standards for the Practice of Conservation v4.0. For more detailed guidance, please see the chapters on Steps 2B (Monitoring Plan), 2C (Operational Plan) & 3 (Implement) of that manual.

How to Develop a Work Plan and Budget

A work plan is a short-term, detailed version of the larger strategic plan you have just completed. It focuses more on the exact "how to" than on the overall strategic justification of your activities. Depending on how your organization operates, you might develop a work plan covering the next few months, or year, that includes:

- What specific activities are required to implement the adaptation interventions from each results chain. It is important to remember to include activities associated with 1) achieving the desired results, 2) monitoring progress and/or key uncertainties, and 3) operational functions (e.g., attending weekly staff meetings);
- Who will be responsible and accountable for completing each activity;
- When each activity will happen and what is the sequence of linked activities, and
- Where each activity will be implemented (are there travel or logistical considerations?); and
- How much money and other resources are needed to complete each activity (see Step 3B of the Conservation Standards for greater detail).

Once you have clearly outlined the activities you need to undertake, you will be able to figure out what resources you need and whether all of the activities you have outlined are feasible. Your work plan will help you develop a more refined estimate of costs for specific activities and the broader adaptation interventions.

The most expensive resource for most projects will be staff time. However, you should also consider any

FIGURE 34. WORK PLAN EXTRACT FOR COOKSTOVE INTERVENTION (# OF DAYS)

Item	Work Units Jan	Feb	Mar	Q1	Q2	Q3	Q4	2019	Total
GIZ CSEbA Tajikistan Example (v0.9)	16	16	31	63	148	98	33	342	342
Energy Efficient Stoves	16	16	31	63	148	98	33	342	342
E. Encourage the use of energy efficient, clean	16	16	31	63	133	68	13	277	277
1. Conduct feasibility study	15	15		30				30	30
Vladi: Vladislav Karimov	15	15		30				30	30
2. Conduct outreach on benefits			20	20				20	20
Jamila: Jamila Kadyrova			20	20				20	20
3. Provide training onuse & maintenance					40			40	40
4. Provide microcredit loans			10	10	30	15		55	55
Erik: Erik Aliyev			10	10	30	15		55	55
5. Provide training on installation					60			60	60
Jamila: Jamila Kadyrova					30			30	30
Vladi: Vladislav Karimov					30			30	30
6. Conduct survey to assess use of cookstoves						30		30	30
Jamila: Jamila Kadyrova						30		30	30
7. Evaluate microcredit loan program effectivene						20		20	20
Erik: Erik Aliyev						20		20	20
8. Measure community fuelwood harvest (m3/mo	1	1	1	3	3	3	3	12	12
9. Conduct focus groups to assess knowledge &							10	10	10
Strengthen law enforcement					15	30	20	65	65

other major expenses associated with your project's implementation, such as physical infrastructure or vehicles. Do not forget to include monitoring and management expenses as you develop the budget. Working closely with finance and accounting staff while developing the budget will help you capture the true cost of the project.

While you develop the work plan, you should also consider what data (e.g. the number of fuel efficient cookstoves installed, the number being used, etc.) will be generated through the implementation of the work plan, budget, monitoring plan, and other relevant project needs. You will need to decide how to capture and analyze that data. Software tools such as Miradi can help with this. You may need to set up protocols and filing systems to store the project data as you gather them. For very small projects, a simple paper-based system may be adequate. For projects involving multiple people or running over longer periods of time, it is highly recommended that you adopt a system early in the project to collect, store, analyze and report your data. You will need to add activities to your work plan to establish these systems and protocols and to maintain your data over the life of the project.

At this point, you will have all the products of a strategic plan. Depending on your needs, you may want to compile this information into a formal plan. Or, if you are using Miradi, you can maintain this information digitally and produce the relevant plans and documentation from Miradi Share. This creates a "living" plan that can be easily updated as your project evolves. It also enables linkage of data, such as budgets, with other organizational systems.

How to Implement Your Strategic Plan (Including Monitoring)

The next and most important part of Step 11 is to implement your plans according to schedule and within budget. This includes implementing both the activities and the monitoring. A kick-off meeting (especially if there are new staff people) is a good way to ensure all team members are familiar with the project design, budget allocations, donor contractual conditions, internal policies and other relevant implementation details. This meeting is also important for team building.

Hint: You should aim to directly engage your implementation team from the start, so that they feel ownership over the plan. Regular team meetings to discuss progress in implementing your project will help your team stay connected and support each other.

It can be helpful to use progress tracking tools so that you know how far along you are on the different activities and tasks required to implement your strategic plan. We recommend creating short, regular progress reports about implementation that will allow for more detailed reflections later on, as well as assist with reporting to donors and supporters.

Example Work Plan and Budget

Figure 34 on the prvious page shows a work plan developed for the promotion of energy efficient, clean cookstoves. For each activity, the table shows how many days each project team will need to dedicate to implement the activity and when they will do this work. The table in Figure 35 adds the expenses for each activity, in addition to the work plan information. Additional guidance on developing a work plan and budget is available in Developing High-level Work Plans and Budgets: An FOS How-to Guide.

FIGURE 35. WORK PLAN AND BUDGET FOR COOKSTOVE INTERVENTION

	Work Units						Projected Expenses						Budget Totals
Item	Q1	Q2	Q3	Q4	2019	Total	Q1	Q2	Q3	Q4	2019	Total	Total
GIZ CSEbA Tajikistan Example (v0.9)	63	148	98	33	342	342	25,500	30,500	30,500	34,500	121,000	121,000	121,000
Energy Efficient Stoves	63	148	98	33	342	342	25,500	30,500	30,500	34,500	121,000	121,000	121,000
E. Encourage the use of energy efficient, clean	63	133	68	13	277	277	25,500	30,500	30,500	34,500	121,000	121,000	121,000
Vehicle & gas							4,500	4,500	4,500	4,500	18,000	18,000	18,000
1. Conduct feasibility study	30				30	30							0
2. Conduct outreach on benefits	20				20	20	1,000	1,000	1,000	1,000	4,000	4,000	4,000
Outreach materials							1,000	1,000	1,000	1,000	4,000	4,000	4,000
3. Provide training onuse & maintenance		40			40	40							0
4. Provide microcredit loans	10	30	15		55	55	20,000	20,000	20,000	20,000	80,000	80,000	80,000
Revolving loan fund							20,000	20,000	20,000	20,000	80,000	80,000	80,000
5. Provide training on installation		60			60	60		5,000	5,000	5,000	15,000	15,000	15,000
Materials for installation								5,000	5,000	5,000	15,000	15,000	15,000
6. Conduct survey to assess use of cookstoves			30		30	30				4,000	4,000	4,000	4,000
Materials for survey field assistants										4,000	4,000	4,000	4,000
7. Evaluate microcredit loan program effectivene			20		20	20							0
8. Measure community fuelwood harvest (m3/mo	3	3	3	3	12	12							0
9. Conduct focus groups to assess knowledge &				10	10	10							0
Strengthen law enforcement		15	30	20	65	65							0

Step 12. Analyze & Adapt

Analyze and Adapt your Plan Based on Your Evidence

Through the course of implementing your project and analyzing your monitoring data, you will generate evidence about what is working and what is not. These valuable lessons can be used to systematically adapt your project and become more effective over time. To do this, your team needs systems to capture and analyze data as well as dedicated time to reflect on the results and decide what to do about them.[10]

As your team engages in the project, you should pass through all the steps multiple times. We recommend your team sets a regular time to reflect on what you have learned from your implementation and adapt your future interventions accordingly. In addition to adjusting your climate adaptation interventions, you should consider reviewing and adapting the associated analyses you have conducted during previous steps (e.g., your situation model, climate vulnerability analysis, and stakeholder assessments). Doing so may help you realize new opportunities or challenges. For example, you may need to add activities to the work plan to engage different stakeholders or address a new climate threat.

How to Analyze, Reflect and Adapt

This step requires managing your data so that it can be used at regular intervals to inform management decisions and adapt your interventions. The amount of time needed to complete this step is often underestimated by project managers, leaving them with lots of data that they have not analyzed or used.

Prepare Your Data for Analysis

It is essential to consistently capture and analyze your monitoring data in order to understand what is happening with your project. Your team should aim to regularly record, store, process, and backup all your programmatic, operational, and financial data. This work will be much easier if you systematically check, clean, and code your raw data as they are collected. Ideally, your systems should manage and present your data to easily meet the key information needs laid out in your strategic plan.

Analyze Results and Reflect on the Analysis

An important aspect of good project management is systematically assessing whether you are on track to achieve your stated goals and objectives. Your monitoring data should help you fill knowledge gaps, determine whether you have achieved your expected intermediate results, and assess whether you are on track to achieve long-term success. Analyzing your monitoring data can help you determine why certain activities have succeeded or failed by providing information on whether the core assumptions you laid out in the planning steps (especially in your situation model and theories of change) hold true in reality.

10 The guidance provided in this chapter draws heavily from Open Standards for the Practice of Conservation v4.0. For more detailed guidance, please see Chapter 4 (Analyze and Adapt) of that manual.

By testing and reflecting on these core assumptions, you are in a better position to adapt and change your project activities accordingly. You should regularly (approximately every 6-12 months) review and reflect on your project. In these reviews, you and your team should consider the following questions:

- Are you on track with implementing your activities? If not, why not? What adjustments should you make?
- Are you achieving the results you expected to achieve and the associated goals and objectives tied to key results? If not, why not? What adjustments should you make?
- Have you addressed other priority information needs (including key uncertainties and changes in your context - as illustrated by dotted lines and question marks in situation model and results chains diagrams)? If so, what does this tell you about your project and any adjustments you may need to make? If you have not addressed those information needs, are they still priorities? And if so, how will you address them in the future?

It is also important to consider the operational processes supporting your project. You may have a project that uses the perfect interventions to address the threats and opportunities affecting your ecosystem targets, but maybe your team is not operating efficiently or does not have sufficient administrative or financial support. Your analysis might explore whether:

- You have sufficient resources (e.g., financial, human, administrative, political) to carry out your project;
- You have the right skills among your team members to implement your project well;
- You have the physical infrastructure and equipment (e.g., office space, vehicles, computers) you need to do your job; and/or
- Your project team operates smoothly (e.g., communications, delegation of responsibilities).

Hint: For learning and effective communication, it is important to involve the right people in the analyses and/or to share preliminary analyses with them.

As a general rule, analyses should involve members of the project team, as they will have the deepest understanding of the project and overall situation. Depending on the context, team members may be conducting the analyses themselves, or they could help review and interpret analyses. However, teams should take care not to unjustifiably influence the findings. While team involvement is important, input from your stakeholders, outside experts, or those with other perspectives is also valuable and can help provide a balanced interpretation of monitoring results.

Adapt Your Strategic Plan

Finally, you should use what you learned during the analyses and discussions to modify and optimize your adaptation interventions and activities as needed. As you make changes, you should also document the rationale and evidence behind them so that others will understand what you learned and why you made these changes. You may learn that some of what you are doing is working well and no adjustments are needed. Learning and ideas for improvement may come from internal discussions with your team, findings from formal evaluations or audits, external stakeholders familiar with your work, and/or research findings relevant to your context. The important thing is to leave time for that reflection and analysis so you can understand how your project is working.

Example of Practicing Adaptive Management

Our example project in Central Asia includes a small group of employees (Vladi, Jamila and Erik) who are working on encouraging local families to install and use energy efficient, clean cookstoves. Having just completed a year of work on this intervention, they took the time to sit down together for a "reflect and adapt" session, to discuss what they have and have not been able to accomplish and how to adapt their work to make it more effective. They rated their progress in implementing each activity, using the following options: completed, on-track, minor issues, major issues, scheduled for the future, abandoned, or not known.

As shown in Figure 36, most of their activities are on track – they completed a feasibility study, showing that the stoves are culturally acceptable and affordable; they conducted outreach on the environmental and health benefits of the stoves; and they provided training on installation, use and maintenance of the stoves. The biggest challenge they have faced has been a delay in getting approval of microcredit loans. They agreed to evaluate how to make the process more efficient. Their monitoring activities were also generally on track, but their survey results indicated that many families continued to use their old, inefficient stoves. They decided to analyze the barriers to adoption of the new technology.

After rating their progress in implementing their activities, they rated the extent to which they had achieved each of the results in their results chain. This produced a "stoplight diagram" (shown in Figure 37) summarizing their progress on activities and results. They debated whether to rate "People install & use EECC" as facing minor issues or major issues. Families were installing the stoves but not using them for all of their cooking. They decided to split this result into two results in the next version of their results chain and rate "People install EECC" as facing minor issues, due to the delays in financing, and rate "People use EECC" as facing major issues. They had not yet achieved a reduction in local demand for fuel wood and they did not anticipate achieving it if they could not overcome the barriers to use of the new stoves.

Conducting a "Reflect and Adapt" session at least once per year allows teams to analyze what has worked and what hasn't worked and adapt their work to increase their effectiveness. In this case, the team decided to analyze the barriers to use the efficient stoves, so that they could address those barriers directly and achieve the level of use needed to reduce local demand for fuel wood.

Step 12.

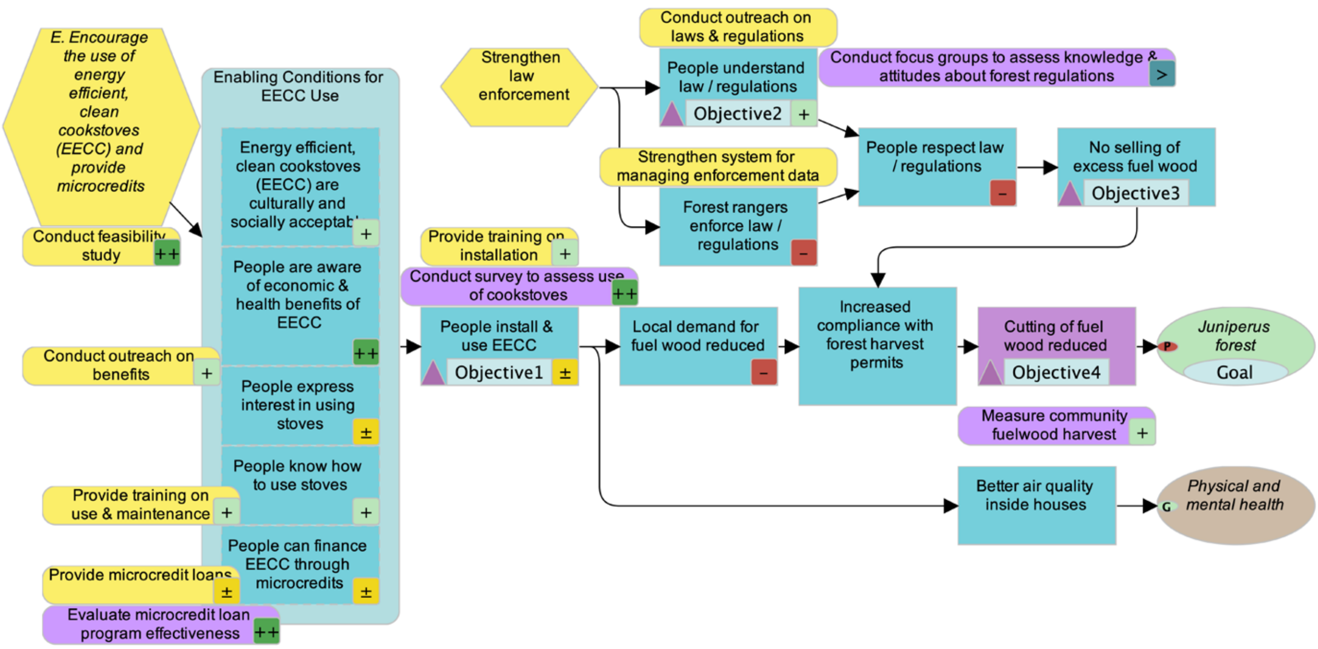
FIGURE 36. EXAMPLE OF PROGRESS REPORTING IN TABLE FORMAT

Item	Progress	Progress Details
GIZ CSEbA Tajikistan Example (v0.9)	**Not Specified**	
Energy Efficient Stoves	**Not Specified**	
E. Encourage the use of energy efficient, clean	**Not Specified**	
1. Conduct feasibility study	Completed	Stoves are culturally acceptable and cost is reasonable for communities.
2. Conduct outreach on benefits	On-Track	Outreach conducted to women about environmental and health benefits of stoves.
3. Provide training onuse & maintenance	On-Track	Classes given to groups of women about how to use the stoves and how to maintain them
4. Provide microcredit loans	Minor Issues	Delays in getting approval for the microcredit loans. Determine how to make the process more efficient.
5. Provide training on installation	On-Track	
6. Conduct survey to assess use of cookstoves	Completed	Many families install the efficient cookstoves but continue using their older stove (out of habit or preference). Need to analyze barriers to adoption of efficient cookstoves.
7. Evaluate microcredit loan program effectivene	Completed	Need to assess why some loans take a long time to get approved
8. Measure community fuelwood harvest (m3/mo	On-Track	Need to find an efficient and reliable way to measure community fuel wood use
9. Conduct focus groups to assess knowledge &	Scheduled	
Strengthen law enforcement	**Not Specified**	

Key

Intervention / Activity / Monitoring

FIGURE 37. EXAMPLE OF PROGRESS REPORTING USING RESULTS CHAIN



Key to Result Evidence / Progress Reports			Key to Results Chain
	Results	**Strategies/Activities**	**Elements**
++	Achieved	Completed	Intervention
+	On-Track	On-Track	Intermediate Result
±	Partially Achieved	Minor Issues	Threat Reduction Result
-	Not Achieved	Major Issues	Ecosystem Target
>	Not Yet	Scheduled for Future	Goal/Objective
x	No Longer Relevant	Abandoned	Activity/Monitoring
?	Not Known	Not Known	Indicator

Step 13. Learn & share

Learn and Share to Improve EbA Broadly

While this manual emphasises the design and planning steps, CoSEbA represents an integrated adaptive management framework that includes guidance for implementation, monitoring, learning and adaptation. This manual focuses on planning because most decisions that will shape project implementation are made during these first stages.

Hint: As more project teams use the EbA process, the learning community will grow and contribute more to the knowledge base and tools for later steps.[11]

Document and Share What You Learn

The long-term success of many EbA activities will depend on the ability of local communities and partner organizations to continue implementation, monitoring and adaptive management over time. If you capture the evidence you generate and your lessons learned in written or recorded documents, you will be able to remember from year to year what you have done, what worked and what did not, and what you plan to do in the future. This will help your project team over the long term and will ensure that new project staff will have a record of what you did and what you learned. Importantly, it will also help the team avoid repeating past mistakes.

Therefore, it is important to ensure that the decision records and project information are accessible for managers and stakeholders to reference over the long-term. You should make sure that you document or record those lessons in appropriate formats so that they remain available to your team, your organization, and the EbA community over time. It is also good practice to note any information gaps that explicitly need to be addressed going forward. The documentation process is time consuming, so it is important to provide both time and incentives to do this work.

Sharing your results and learning with an appropriate external evidence base regularly will help other practitioners using EbA to benefit from your experience and avoid problems you may have encountered and, ultimately, to more effectively achieve adaptation goals. These results and knowledge could be captured in a peer-reviewed publication, in online data systems, or in a more informal place (such as a newsletter) where people can access them. Again, because partner communities will be responsible for long-term implementation, it is crucial that learning is clearly captured and shared in an accessible format.

For more information on sharing your story in a structured way to a targeted audience, see Steps 4 and 5 of the Conservation Standards 4.0 manual.

Create a Culture of Learning

Finally, for EbA to be successful on a large scale, we all need to work toward creating a learning culture within our project teams, across organizations and partners, and among conservation and EbA practitioners around the world. Although this is listed as the last step, it really is something you and your organization need to cultivate right from the start. To effectively apply the Conservation Standards to EbA, you need a project environment that promotes

11 The guidance provided in this chapter draws heavily from Open Standards for the Practice of Conservation v4.0. For more detailed guidance, please see the chapter on Step 5 (Share) of that manual.

evidence-based EbA and adaptive management. This means that you, your team, and your organization should be regularly reflecting, seeking feedback, and providing feedback.

Creating a learning environment is not easy. It requires leaders and donors who understand the need to reallocate scarce resources from immediate action to the long-term work of evidence-based EbA and adaptive management. It often requires allowing practitioners to take some chances and question the conventional wisdom related to specific tools and interventions. It requires providing project teams with the security that innovation and questioning assumptions are valued. And it requires a commitment to share both successes and failures broadly – to create true communities of practice.

Example of Learning and Sharing

Around the world, millions of fuel efficient, clean cookstoves have been built to reduce deforestation, greenhouse gas emissions, and indoor air pollution. Yet a large-scale, four-year evaluation of efficient cookstove use in India concluded that, while smoke inhalation initially fell, this effect disappeared by the second year, at which point the stoves produced no health or environmental benefits, because households used them irregularly and inappropriately and did not maintain them (Hanna et al., 2016).

The Central Asia cookstove team was determined that their project would not meet the same fate. They reviewed literature to learn about common obstacles to clean cookstove adoption. They learned that cookstoves are often designed for mass production at low cost, but the designs do not take into account the needs of the end users. Families prefer the taste of food cooked traditionally on open fires. Cleaner fuels, such as electricity and liquid natural gas, are prohibitively expensive for the poorest families.

The team adapted their project, placing more emphasis on testing and improving the stoves with local women. They analyzed what the women liked and did not like, adapted the cookstove design to their preferences, and then measured whether the women used the adapted cookstoves more often. Once they found a locally acceptable design, they trained local leaders to install and maintain the stoves and measure the extent to which households were using them. By making a multi-year commitment to analyzing whether the stoves were being used and making adjustments to respond to local feedback, the team was able to dramatically increase adoption of the stoves. They documented and shared their experience with other organizations in Central Asia, to improve the effectiveness of fuel efficient cookstoves throughout the region.

Annex 1 - 7

Annex 1. Additional Conservation Standards Resources

THE FOLLOWING RESOURCES HAVE BEEN REFERENCED AT VARIOUS POINTS IN THIS MANUAL AND ARE USEFUL TO CONSULT FOR A MORE DETAILED UNDERSTANDING OF SOME STEPS OF THE FRAMEWORK.

General Manual on the CMP Open Standards for the Practice of Conservation

- Conservation Measures Partnership (2020). The Open Standards for the Practice of Conservation, Version 4. Unspecified place: Conservation Measures Partnership. 77 pp. URL: http://cmp-openstandards.org/download-os/.

Miradi & Miradi Share Software

Miradi - a Swahili word meaning "project" or "goal" - is an easy-to-use software that allows EbA planners to design, manage, monitor, and learn from their adaptation measures. he software can help EbA planners to meet their goals more effectively. It has been designed for biodiversity conservation and natural resource management projects, but is equally useful for EbA projects. It combines project design with operational planning, monitoring and learning functions. A full test version is available for free at https://www.miradi.org/. The software is not necessary but it is very helpful.

More recently, Miradi Share has come online to facilitate more seamless file sharing among team members, allow for the sharing of files with the conservation community, and permit the rolling up of data across various projects in a portfolio.

Miradi Self-guided Tutorial

- Conservation Measures Partnership and Sitka Technology Group (2016). Miradi self-guided tutorial. Unspecified place: Conservation Measures Partnership and Sitka Technology Group. URL: https://www.miradi.org/.

FOS Guidance on Conceptualizing and Planning Conservation Projects and Programs

- This training manual provides detailed guidance on conceptualizing and planning conservation projects and programs. It is based on the Adaptive Management principles and practices in the Conservation Measure Partnership's Open Standards for the Practice of Conservation. Materials in this manual have been adapted from previous works produced by Foundations of Success and members of the Conservation Measures Partnership. URL: https://fosonline.org/library/conceptualizing-and-planning-manual/

More Detailed PPT Presentations on Individual Generic Steps of the Conservation Standards

- Conservation Coaches Network (2012). Harmonized Conservation Standards Presentations. Unspecified place: Conservation Coaches Network. 11 PPT presentations in English and one in French. URL: http://cmp-openstandards.org/guidance/basic-open-standards-presentations-ccnet-2012/.

CMP Guidance on Human Well-being in Relation to Ecosystem Management

- Conservation Measures Partnership (2016). Incorporating Social Aspects and Human Wellbeing in Biodiversity Conservation Projects. Version 2.0. Unspecified place: Conservation Measures Partnership. URL: http://cmp-openstandards.org/guidance/addressing-human-wellbeing/.

Annex 2.
Is an EbA Process Feasible and Useful?

Discussion Questions

1. Does the community depend on provisioning or regulatory ecosystem services from nearby ecosystems, or is it likely that the community will depend on regulatory ecosystem services from nearby ecosystems to buffer against the impacts of projected climate change?

2. Are these ecosystem services and ecosystems already – or likely to be – affected by climate change, including increased climate variability?

3a. Are at least some local people aware of climate change and their vulnerabilities to it?
3b. Are locals willing to enter an adaptation planning and implementation process at this point in time?

4a. Do the community members have the time and resources to participate in the EbA planning process?
4b. Is the proposed schedule of the process in line with seasonal activity and availability patterns of the community and particularly community leaders?
4c. Are all important stakeholders (for decision-making) available to participate in the process?

5a. Does the community have the basic capacity and user rights to manage ecosystems and natural resources that can help reduce vulnerability to climate change?
5b. Will there be sufficient resources to support the implementation of the interventions identified during the EbA planning process?
5c. Are there other opportunities to support implementation? What steps are needed to ensure these opportunities are used effectively? What is the likelihood of securing the necessary resources?
5d. Is there sufficient capacity among local partners to ensure the effective implementation of the EbA portfolio, including learning and adaptive management?

Annex 3. Using Climate Data From General Circulation Models

To plan for ecosystem-based adaptation, it is important to have an understanding of how the local climate has changed so far. It is also important to compare actual observed changes in climate with how the community perceives these changes. Sometimes this information can be difficult to obtain if there is no local weather station collecting this data, or if the information is not accessible to the public. If this is the case, check with community members. Sometimes individuals keep written records of weather data privately. An alternative is to discuss how to best estimate observed climate change with a climate scientist.

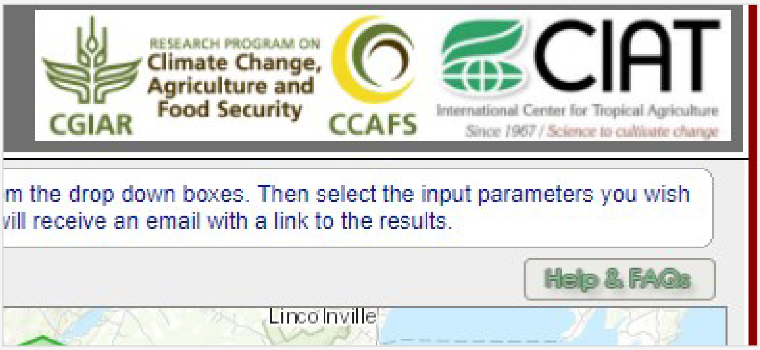
Climate change projections for the local area are required for the scenario planning (see Step 5 of this manual). It is best to work with a climate scientist to produce this information. Climate scientists typically develop projections by running a full suite (20-30) of GCMs (**general circulation models)** that they can downscale to make them relevant to the planning area. However, many climate scientists do not run projections that are useful for adaptation planning. There are a few things the planning team should be aware of and ask for when working with a climate scientist.

- Often climate change projections have temporal scales that are irrelevant to near-term planning. Projections for 2070 or 2100 have greater uncertainty, are difficult to plan for and are often not the concern of stakeholders facing real impacts today and in the next 10-20 years. We recommend using projections for 2050 (which is the naming convention for the time period covering 2041-2070) at the latest, or even 2020 (2011-2040) to ensure relevance to the community and planning.
- You will also need to have projections by month and locally appropriate seasons. Climate scientists often produce "seasonal" projections based on 3-month seasons found in the temperate climate of Europe and North America: spring (March, April, May); summer (June, July, August); autumn (September, October, November); and winter (December, January, February). These often do not match how communities in other regions of the world perceive "seasons." There may be a dry season and a wet season, each spanning several months that do not correspond with traditional temperate seasons. Local communities may also define seasons in terms of their livelihoods: planting, harvesting, taking livestock to pastures, etc., which closely correspond with local changes in temperature and rainfall. It is important to understand this when asking for climate change projections from a climate scientist, so that seasonal changes are relevant to local stakeholders.
- Climate scientists almost always provide projections in terms of the average of outputs from each of the various GCMs they use. Such results appear deceptively simple. For example, one climate model projects a 25% increase in rainfall, while another projects a 25% decrease. The average of the two indicates no change in rainfall, a result that would be highly unlikely. To account for this uncertainty (range in outputs) of climate change projections, the method uses "scenario planning" where different potential climate futures are envisioned (see Step 5). It is important that the climate scientist provides projections that explicitly include the range of outputs among models to make best use of the method.
- It is important to have projections for climate variables that are most relevant to local livelihoods and ecosystems. Climate scientists may only provide average daily temperatures for a particular month, when night time low temperatures might be more important for certain species or crops. Climate scientists are also getting better at projecting extremes, particularly for temperatures. The number of days over a certain temperature in a given month or year might be extremely relevant for the community. Talk to your climate scientist to learn the full range of climate variables available and then request projections for those most relevant to the community planning process.

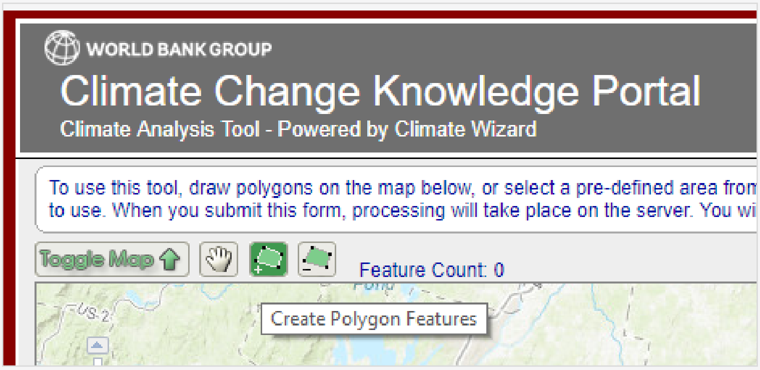
Annex 4. Instructions for Using Climate Wizard to Develop Climate Scenarios

THIS ANNEX INCLUDES SIMPLE, STEP-BY-STEP INSTRUCTIONS FOR USING CLIMATE WIZARD TO DEVELOP CLIMATE SCENARIOS. MORE DETAILED INFORMATION ABOUT CLIMATE WIZARD CAN BE FOUND IN THIS ARTICLE: APPLIED CLIMATE-CHANGE ANALYSIS – THE CLIMATE WIZARD TOOL.[12] IF YOU ENCOUNTER PROBLEMS USING CLIMATE WIZARD, CONTACT EVAN GIRVETZ.[13]

1. Open Climate Wizard[14]
   Note that Help & FAQs can be accessed in the upper right hand corner:



2. Zoom into your area of interest, and create a polygon (alternatively you could load a shapefile):

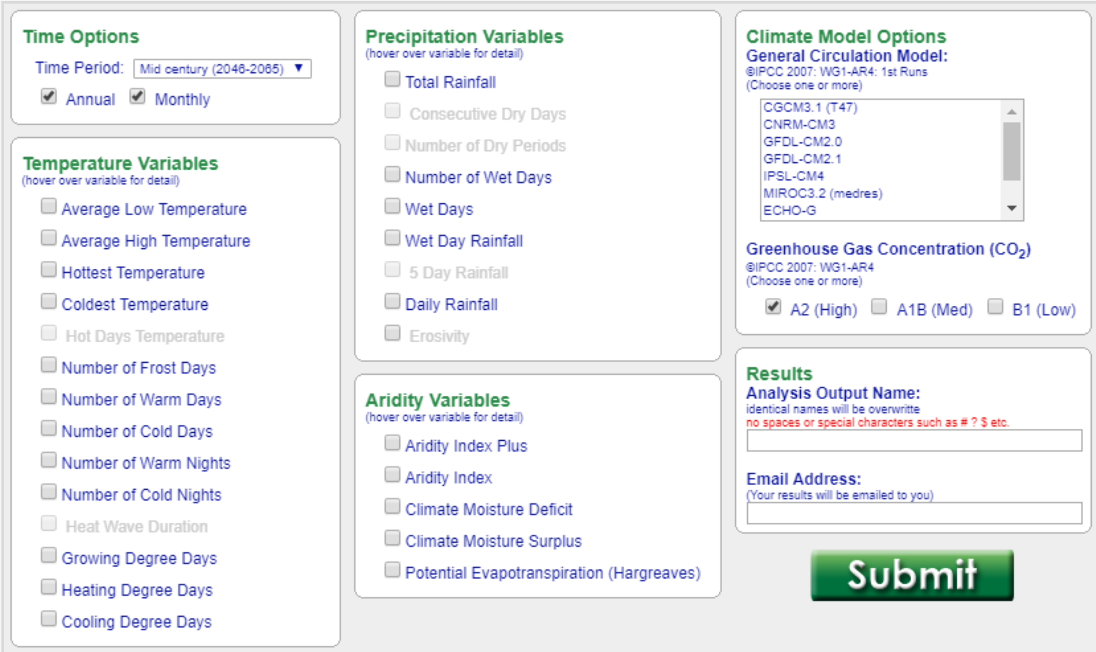


3. When finished, assign your polygon a name.

12 https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0008320

13 e.girvetz@cgiar.org

14 http://climatewizard.ciat.cgiar.org/



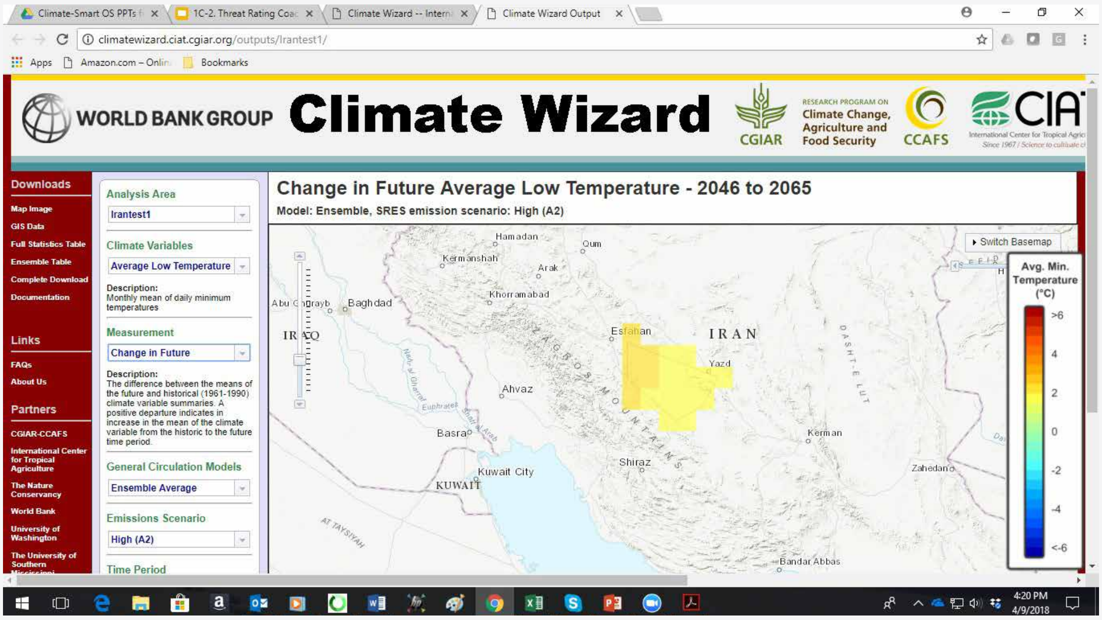
4. Scroll down to select output parameters:
   a. Select a **Time Option** - for the exercise, choose "Monthly," and either one of the **Time Periods**. We suggest running one time period at a time because it makes the output easier to manipulate.
   b. Select the **Temperature Variables** you are most interested in.
   c. Select the **Precipitation Variables** you are most interested in.
   d. Select the **Aridity Variables** you are most interested in.
   e. Using your shift key, highlight all of the available **General Circulation Models**.
   f. For the exercise, select SRES **Greenhouse Gas Concentrations** "A2 (High)." Note that these greenhouse gas concentrations are "outdated" (the current technique is to work with Representative Concentration Pathways), but they will work perfectly well for our efforts to examine variability between the models.

5. Create a name for your output files (be careful not to use spaces or special symbols).

6. Write in your email address.

7. Click **Submit.** Your output will be emailed to you when the analysis is completed in anywhere from ½ hour to 2 hours.

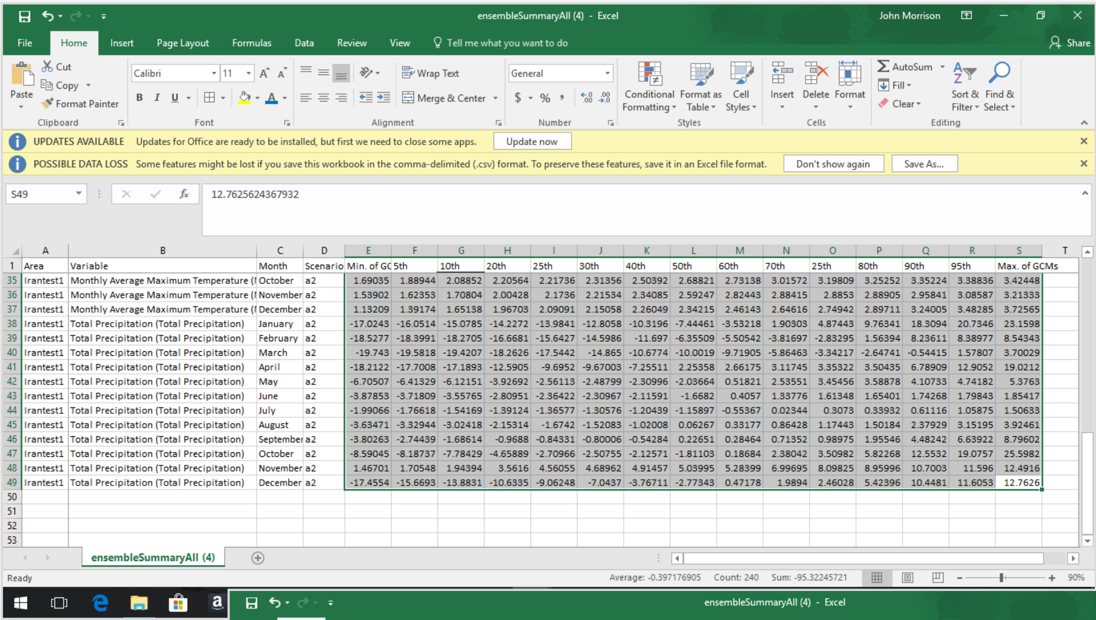
8. You will receive an email with a link. Click the link to be taken to the Climate Wizard site again, this time to your results.

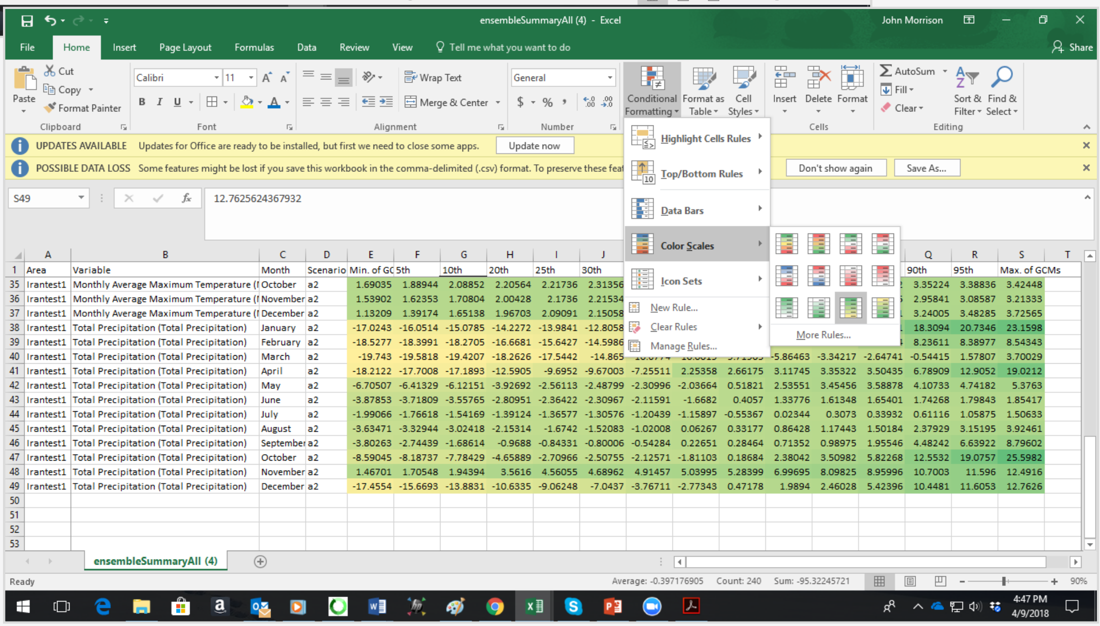


Explore the dropdowns on the left to see what your results look like on the screen. You can explore the various **Climate Variables** that you chose, look at various **Measurement** options ("Future Average," "Change in Future," "Historical Average," etc.). Note that the scale on the right will change depending on which Measurement you're looking at. You can also look at different subsets of the models under the **General Circulation Models** dropdown. Visualizing the output onscreen is helpful, but to construct our climate scenarios let's look at the data table.

9. Look in the upper lefthand corner of the screen - you can download a number of files here, as described.

10. Click on **Ensemble Table** and you will download an Excel file containing a summary of the main output (in the format "ensembleSummary(All))." Open the Excel file and look at the data. You should recognize the variables that you selected in column B (e.g. "Total Precipitation"). The numbers in each cell represent the **change in future values** for each variable, arranged from the minimum value of all of the GCMs ("Min. of GCMs" column) up to the maximum of the GCMs ("Max. of GCMs" column) – note that the maximum value between months might be from different models. Between the minimum and the maximum, the values are arranged by percentiles. What we want to do is to identify, for the variables that you selected and are important for either ecosystems or people (or both), those variables that the models show have the most variability (= future uncertainty).

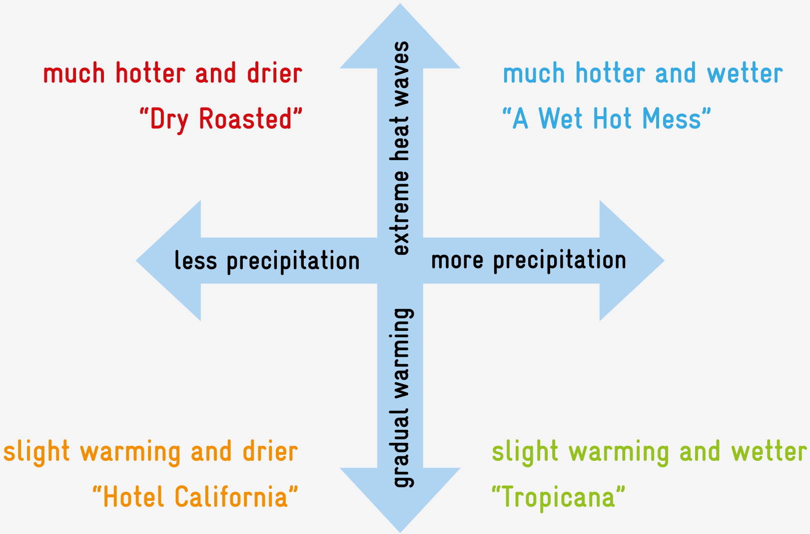




11. A suggestion for reviewing the output: highlight all of the cells associated with any one variable:

12. Under the "Home" tab of Excel, look for "Conditional Formatting." There is a drop-down menu that provides options for formatting a group of cells. If you choose one of the "Color Scales" it will make it easier to see the distribution of low and high values for each variable in your output.

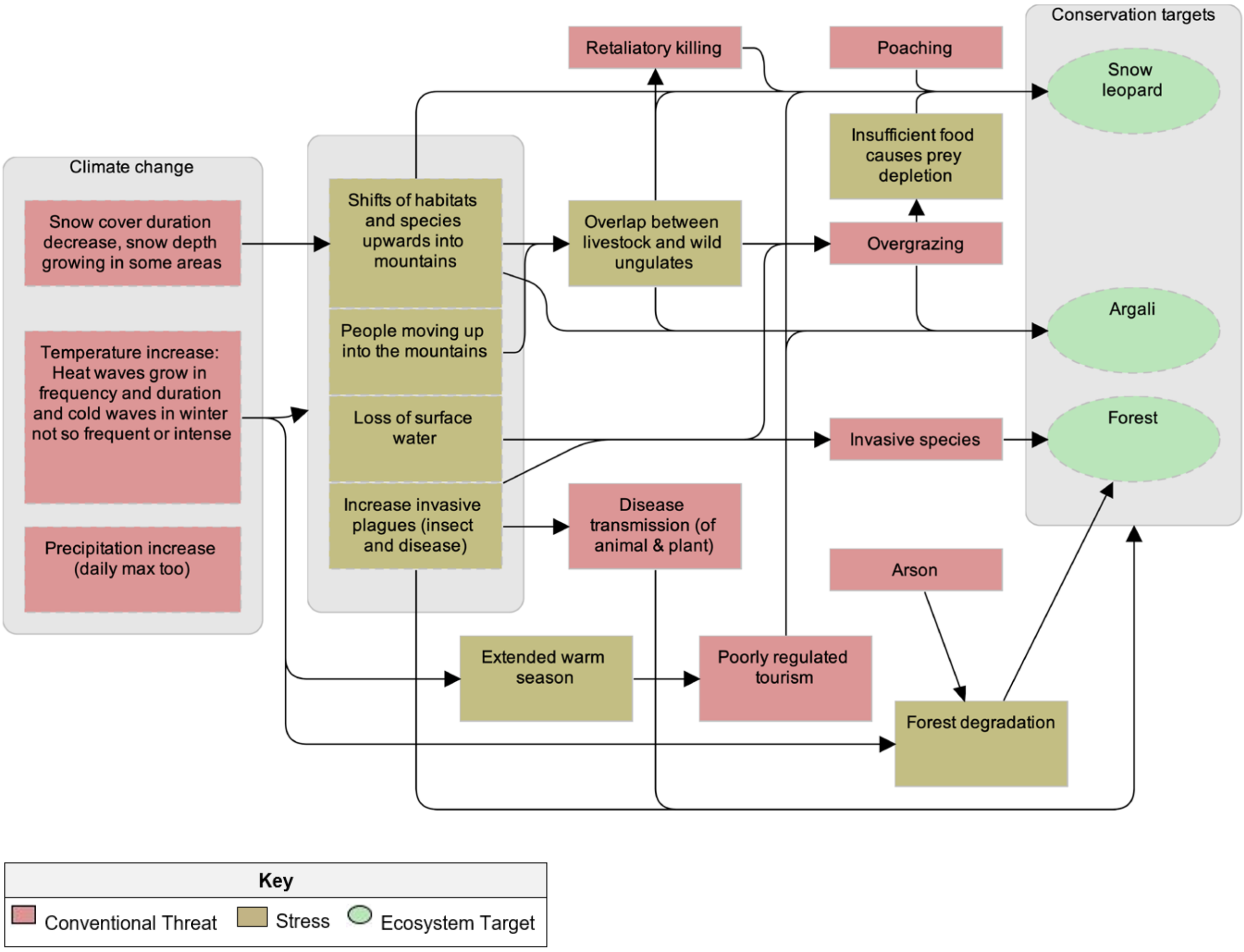
13. For each variable, for the month/season that is of most interest to your site, outline the values in the 10th and 90th (or 20th and 80th) percentiles. We will ignore the lower and higher values as outliers.



14. For the month that is of most interest (or shows the most variation between highest and lowest), add or subtract the values in the output from the historical average values (from weather data that you have or from looking at cells in the screen output). These values are potential ends of one axis for your future climate scenario.

15. Repeat steps 11-14 for another variable and you will have two axes to work with to develop climate scenarios:

Annex 5. Situation Model Example



The figure above represents a portion of a situation model from a steppe ecosystem in Asia. This "climate situation model" contains only climate threats, conventional threats, and the associated biophysical impacts. Stripped of the contributing factors, the diagram highlights the conventional and climate threats to three conservation (ecosystem) targets, and the relationships between the threats. In the example there is no conventional threat that is not exacerbated by climate change. Some of the climate threats affect the conservation (ecosystem) targets directly (e.g., warmer drier climate driving habitats upslope), and some climate threats act through human reactions (e.g., humans moving upslope and consequently causing more human wildlife conflict).

Annex 6. Glossary

THE FOLLOWING GLOSSARY CONTAINS EXPLANATIONS FOR A NUMBER OF TERMS THAT ARE USED COMMONLY IN THE CONTEXT OF COSEBA.

Adaptive capacity: a measure of the ability of a system or species to adjust to climate change impacts with minimal disruption.

Climate: The average weather conditions prevailing in an area over the long term (> 30 years).

Climate change: Long-term changes of climatic parameters of an area over the long term (> 30 years).

Climate change impact: A specific impact of a changed climate parameter (e.g. temperature, precipitation, onset of a season) on the viability of a target ecosystem or population. Analogous to a -> direct (conventional) threat.

Climate robust intervention: Interventions that will be effective under all climate scenarios (e.g., regenerative agriculture techniques increase the health of the soil and can increase resilience to either very wet or very dry conditions)

Climate threat: natural phenomena altered by the mainly human-caused increase in global surface temperatures and its projected continuation (e.g., increased spring precipitation, decreased snow pack).

Climate vulnerability: The degree to which a community, ecosystem, habitat, or species is likely to be harmed by climate change. It is a function of exposure, sensitivity and adaptive capacity.

Climate vulnerability assessment: The process of assessing how climate change is likely to impact your ecosystem targets, often considering multiple possible scenarios.

Co-benefits: Positive benefits from an intervention beyond climate change adaptation. These can include more sustainable natural resource management or short-term economic benefits that may increase stakeholder support for an adaptation intervention.

Contributing factor (see also indirect threat & opportunity): A factor identified in the situation analysis that contributes to conventional threats. Can be an entry point for adaptation measures. Contributing factors can be socio-economic, institutional, cultural, capacity related, technical or other factors. Contributing factors can also be called drivers and root causes.See also -> direct (conventional) threat (adapted from CMP 2013).

Conventional threat: A human activity that directly and negatively affects the viability of an ecosystem. CoSEbA uses the term "conventional" to designate those threats that are not related to climate change. See also stress and climate change impact (adapted from CMP 2013).

Core Team: A small group of community leaders, community stakeholders, local conservation/development project representatives, and other essential contributors (e.g., climate scientist, trained facilitator, etc.) who take charge of the planning process.

Ecological drawing: a drawing of the project scope. It includes the communities and ecosystems (forests, rivers, grasslands, etc.) that provide resources for community members.

Ecosystem: The entirety of the living community (plants, animals, fungi and micro-organisms) of an area and its physical environment, including all functional relationships within the community and with the non-living environment.

Ecosystem-based adaptation to climate change (EbA): Adaptation of human communities to the impacts of observed or projected -> climate change that is based on managing ecosystems in such as way as to help communities adapt. EbA is usually used in conjunction with other, non-ecosystem based approaches to adaptation.

Ecosystem services: Services that intact, functioning ecosystems, species, and habitats provide and that can benefit people.

Ecosystem target: An ecological system or a species on which the community depends for ecosystem services.

Exposure: the nature and degree to which a system is exposed to significant climate variations.

General circulation model (GCM): A type of climate model. It employs a mathematical model of the general circulation of a planetary atmosphere or ocean. It uses the Navier–Stokes equations on a rotating sphere with thermodynamic terms for various energy sources (radiation, latent heat) and is used to project parameters of future climate.

Goal: A formal statement detailing a desired impact of a project, such as the desired future status of a target ecosystem (adapted from CMP 2013).

Human well-being target: In the context of an EbA project, human well-being targets focus on those components of human well-being affected by the status of ecosystem targets. All human well-being targets at a site should collectively represent the array of human needs addressed by ecosystem services from the ecosystem targets.

Indirect threat: A driver, or root cause, of a conventional threat.

Intervention: A set of activities with a common focus that work together to achieve specific goals and objectives by targeting key intervention points, integrating opportunities, and limiting constraints. A good intervention meets the criteria of being: linked, focused, feasible, and appropriate.

Key ecological attribute (KEA): Aspects of an ecosystem target's ecology that if present, define a healthy ecosystem and if missing or altered, would lead to the outright loss or extreme degradation of that ecosystem target over time.

Livelihood: The capabilities, assets (including both material and social) and activities required for a means of living.

Maladaptive intervention: Interventions that cause harm to socio-ecological systems, i.e. that foster adaptation in the short-term but insidiously affect systems' long-term vulnerability and/or adaptive capacity to climate change (e.g., helping ranchers change their livelihoods from grazing to irrigated agriculture may help them to adapt to increased drought in the short term, but it also increases diversion of water from rivers and streams, causing them to dry up for longer periods).

Objective: A formal statement detailing a desired outcome of an adaptation measure such as reducing a -> direct (conventional) threat. If the measure is well conceptualized and designed, realization of its objectives should lead to fulfilling the adaptation -> goal. See also -> result (adapted from CMP 2013).

Open Standards for the Practice of Conservation: An integrated approach and methodology for the design, planning, implementation, monitoring, adaptive management and learning from projects, programs and similar activities in the field of biodiversity conservation and sustainable natural resources management (link: http://cmp-openstandards.org/).

Opportunity: A contributing factor identified in the situation analysis that potentially is limiting one or more -> direct (conventional) threats, and can be enhanced through adaptation measures. In some senses, the opposite of an indirect threat or driver of a conventional threat (adapted from CMP 2013).

Prediction (of climate change): A climate parameter for which all consulted general circulation models project for the time of interest in the future. If all GCMs project the same then these identical projections can be considered a prediction.

Projection (of climate change): The output of one general circulation model for a given climate parameter, for a specified time in the future.

Result: The desired outcome of an adaptation measure, part of a results chain. There are threat/impact reduction results, restoration results and other terminal results (at the end of the results chain) on the one hand, and intermediate results (in between the measure and the terminal results) on the other hand.

Results chain: A graphical depiction of a project's core assumption, the logical sequence linking project interventions to one or more targets. In scientific terms, it lays out hypothesized relationships.

Scenario (of climate): A complex, multi-parameter description of a possible climate at a defined moment in the future. Can be expressed in terms of a relative change to the current climate.

Scenario planning: The use of climate scenarios to identify potential future changes to ecosystem targets in order to identify uncertainty and plan accordingly for monitoring and adaptation.

Seasonal calendar: A simple tool for describing the seasons in the project area, ecological events tied to specific times during the year, natural resource management activities, and important cultural events. It provides information about how humans depend on ecosystems for their well-being.

Sensitivity: the nature and degree to which a system is affected, either adversely or beneficially, by climate-related stimuli.

Sometimes effective intervention: Interventions that will only be effective under some scenarios but will not be "maladaptive" (cause harm to ecosystems or communities) under any climate scenarios (e.g., drip irrigation can decrease the impact of drought on agricultur al areas but will not be helpful -- or harmful -- if precipitation increases and fields get waterlogged for weeks at a time).

Stress: An impaired aspect of a target ecosystem (or target population) that results directly or indirectly from conventional or climate threats or climate change impacts (e.g., low population size; reduced river flows; increased sedimentation; lowered groundwater table level). Generally equivalent to a degraded key ecological attribute (adapted from CMP 2013).

Temporal buffer: An outcome from an intervention that corrects for seasonal mismatches caused by climate change (e.g., water storage for irrigation in a place where climate change has altered precipitation during important agricultural periods).

Theory of change: A clear set of assumptions about how you think your intervention(s) will help you achieve both intermediate results and longer-term conservation and human well-being goals. Your theory of change can be expressed in text, diagrammatic, or other forms.

Viability: The structural and functional intactness or ecological health of a target ecosystem or population, that determines its resilience and resistance to external perturbations and its likelihood of persistence in the future.

Vision statement: A brief summary of the project's vision. A good vision statement meets the criteria of being relatively general, visionary, and brief.

Weather: The atmospheric conditions including temperature, precipitation, wind etc. at a given place and time.

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