CLIMATE-SMART CONSERVATION PRACTICE: USING THE CONSERVATION STANDARDS TO ADDRESS CLIMATE CHANGE

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Ecosystem-based Adaptation in High Mountainous Regions of Central Asia

CLIMATE-SMART CONSERVATION PRACTICE: USING THE CONSERVATION STANDARDS TO ADDRESS CLIMATE CHANGE

Version 1.0

Developed by representatives of
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and
the Climate Guidance Working Group of the Conservation Measures Partnership

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ABOUT THIS DOCUMENT

Climate-Smart Conservation Practice is a product of collaboration between the project "Ecosystem-based Adaptation in High Mountainous Regions of Central Asia" of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the Climate Guidance Working Group of the Conservation Measures Partnership (CMP). We have worked together to develop this guidance based on examples from Central Asia, but aimed at a global audience of conservation practitioners developing climate conscious projects.

The main example used throughout this guidance is loosely based on a project that GIZ implemented jointly with the Michael Succow Foundation and Camp Tabiat in Tigrovaya Balka Strict Nature Reserve, Tajikistan. However, the authors have simplified the example project, taking significant creative liberties in order to effectively illustrate the methodology presented in the guidance. For this reason, we refer to the example project as a "Tugai Strict Nature Reserve in Central Asia."

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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.

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[1] 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 wellbeing.

World Wildlife Fund (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 planet'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.

The Michael Succow Foundation is a German foundation that works to preserve, sustain, and value nature. Initially specialized in the development and protection of national parks and biosphere reserves in post-Soviet countries, the Foundation now engages in projects on four continents on climate change mitigation and adaptation, protected areas, sustainable land use, and the promotion of young conservationists.

CAMP Tabiat is a branch of the public foundation CAMP Alatoo in Tajikistan. Both organizations grew out of the Central Asian Mountain Partnership (CAMP), a program funded by the Swiss Agency for Development and Cooperation to promote sustainable development in mountain regions of Central Asia.

1 https://cmp-openstandards.org/

EXECUTIVE SUMMARY

This guidance is intended to support practitioners undertaking conservation planning in the face of the uncertainties created by climate change. It builds on the already widely used Conservation Measures Partnership's Open Standards for the Practice of Conservation[2] (Conservation Standards) by walking through each of the five steps and providing additional guidance on incorporating climate considerations. These additional tools and methodologies were developed and refined by experienced facilitators who have worked with a number of teams struggling to plan climate-smart conservation projects around the world.

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 can help teams (composed of conservationists and other stakeholders) to identify priority ecosystems, assess conventional (non-climate) and climate-related threats, and determine the most appropriate strategies.

By applying this guidance, conservation teams will be able to:

- document the observed and likely impacts of climate change on their ecosystems and species of interest
- examine the relationships between climate change and other, conventional threats
- identify the socioeconomic factors contributing to the conventional threats
- define climate-smart strategies, and clearly lay out how they believe these strategies will address both climate and conventional threats and contribute to conserving or restoring their focal ecosystems and species (i.e., define their "theory of change")
- determine how to monitor and evaluate progress toward their goals and objectives, to ensure adaptive management and ongoing learning

Through the adoption of climate-smart strategies, conservation practitioners can enhance biodiversity conservation and reduce the vulnerability of ecosystems and species to climate change in a way that is sensitive to human needs and likely human responses to climate change. By systematically bringing in evidence from plausible climate change scenarios and applying it to their situation, they can prepare a robust plan, while also building in flexibility for adaptation as new information comes to light.

Climate-Smart Conservation Practice consists of the 5 steps from the Conservation Standards, with several additional sub-steps. Not all steps need to be taken by a given project, depending on its purpose and context.

2 https://cmp-openstandards.org/

STEP 1: ASSESS

1A. PRECONDITIONS AND TEAM
The conservation practitioners leading the planning process should consider enabling conditions for applying this approach, what socio-economic and ecological baseline information they need, and who to include on the planning team.

1B. DEFINE YOUR SCOPE, VISION, AND CONSERVATION TARGETS
This step entails defining the geographic and social scope of the project, identifying the ecosystems and species on which to focus, and developing a "vision statement" that summarizes the ultimate conditions that the team is working to achieve. Where applicable, the team may also choose to include the ecosystem services provided by the focal ecosystems and the human wellbeing benefits derived from those ecosystem services.

1C. DESCRIBE THE CURRENT STATUS OF CONSERVATION TARGETS
In this step, the team documents the current health of their focal ecosystems and species.

1D. IDENTIFY CONVENTIONAL THREATS
In this step, the team identifies the current and potential conventional (non-climate) threats to the focal ecosystems and species.

1E. UNDERSTAND THE VULNERABILITY OF ECOSYSTEMS, SPECIES, AND PEOPLE TO CLIMATE CHANGE
This step focuses on analyzing how the focal ecosystems and species 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 interactions between conventional threats and climate impacts for each scenario.

1F. PRIORITIZE THREATS
Once the team has a better understanding of future climate change impacts and their interaction with conventional threats, the team is in a position to rate and prioritize the threats and decide which ones to address. We suggest a slightly different rating system for conventional and climate threats.

1G. COMPLETE SITUATION ANALYSIS
This step focuses on identifying the most important social, cultural, economic, political, and financial factors contributing to the conventional threats.

STEP 2: PLAN

2A. RE-EVALUATE PROJECT SCOPE AND TARGETS AND SET GOALS

This step provides an opportunity to pause and reflect on the original scope of the planning effort and goals. We recommend asking questions like: Is the original scope of the effort large enough to account for the function of the key ecosystems and species? Given the anticipated climate changes, does it make sense to focus on protecting current ecosystems and species or plan for ecosystem transitions?

2B. SELECT CLIMATE-SMART STRATEGIES

In this step, the team decides what suite of activities to implement to address the threats identified. We suggest ways to use the situation model from "Step 1G: Complete Situation Analysis" to consider a wide range of possible options. We also suggest ways to prioritize among possible strategies.

2C. DEVELOP THEORIES OF CHANGE AND MONITORING PLAN

This step focuses on developing a "results chain" to document the team's assumptions about how each strategy will contribute to reducing conventional threats to ecosystems and species and/or enhancing their resilience to climate change.

STEP 3: IMPLEMENT

3. IMPLEMENT YOUR STRATEGIES

This step is the culmination of the planning process, where the team considers how to allocate their human and financial resources. They develop a detailed work plan and budget and undertake the chosen activities.

STEP 4: ANALYZE AND ADAPT

4. ANALYZE AND ADAPT YOUR PLAN

This step focuses on conducting periodic monitoring to assess the extent to which implementing the strategies is leading to desired results and contributing to reducing threats and improving the status of focal ecosystems and species. At this point, the team uses its monitoring data to make strategic adjustments to increase the effectiveness of its strategies.

STEP 5: SHARE

5. LEARN AND SHARE

Conservation teams can have an impact beyond the scope of their individual projects if they take the time to understand what worked, what did not, and how to improve their projects – and then share the results with others.

List of Acronyms

CAMP	Central Asian Mountain Partnership
CBD	Convention on Biological Diversity
CCNET	Conservation Coaches Network
CMP	Conservation Measures Partnership
CS	Open Standards for the Practice of Conservation or “Conservation Standards”
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 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
WWF	World Wildlife Fund

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INTRODUCTION

Climate change is increasingly threatening natural ecosystems and the people who depend on them, yet incorporating the complex set of impacts into regular conservation planning is challenging. While biodiversity conservation practitioners have successfully applied the Open Standards for the Practice of Conservation[3] (hereafter: the Conservation Standards) to thousands of conservation projects over the last ten years, incorporating climate change has posed complications. The timeframe of climate impacts is often different from that of "conventional" (non-climate) threats to biodiversity. There is considerable uncertainty about the amount of greenhouse gases (GHG) the world will emit, how the **climate** will actually change, the impacts of those changes on ecosystems and species, and the effectiveness of our strategies in the face of the combined impacts of conventional threats and climate change.

KEY TERMINOLOGY

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

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

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

Conservation planning is already perceived by some as complicated and time consuming. The climate change community stresses the integration of climate change into all planning, yet most climate guidance is focused only on "climate change adaptation," treating climate separately from addressing conventional threats to biodiversity. With this in mind, we have created this guidance to integrate climate change into the planning and management of conservation projects and areas, in a way that is scalable and results in the most appropriate and adaptive conservation strategies. Please use only what is helpful from this guidance – not every step may be useful for your situation.

Climate-Smart Conservation Practice is a product of collaboration between the project "Ecosystem-based Adaptation in High Mountain Regions of Central Asia" of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the Climate Guidance Working Group of the Conservation Measures Partnership (CMP). We have worked together to develop this guidance based on projects from Central Asia, but aimed at a global audience of biodiversity conservation practitioners interested in developing strategies that integrate climate change.

This guidance is a companion to an existing document detailing a similar planning process for working with communities on ecosystem-based adaptation (EbA), Conservation Standards Applied to Ecosystem-based Adaptation[4]. When applying EbA, the focus is on assessing how climate change may affect human communities and incorporating this knowledge into the adaptive management of projects that use ecosystem conservation and restoration to reduce the impact of climate change on communities (e.g., watershed restoration can reduce flooding of downstream communities). **Climate-Smart Conservation Practice** focuses on analyzing the potential impact of climate change on ecosystems and species and incorporating this knowledge into the adaptive management of biodiversity conservation projects.

GIZ and CMP created this guidance to build on the already widely used Conservation Standards.

3 https://cmp-openstandards.org/
4 https://www.adaptationcommunity.net/download/GIZ-CMP_CoSEbA-Guidance.pdf

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. They represent the leading adaptive management framework in the field of biodiversity conservation and ecosystem management. They are available in various languages, including English, French, Spanish, Portuguese, Mandarin, Russian, Albanian, Indonesian, Persian, and Korean.

The Conservation Standards are based on a project cycle that includes five steps: (1) Assess, (2) Plan, (3) Implement, (4) Analyze and Adapt, and (5) Share (Figure 1). The approach enables teams to learn what works, what does not work, and why — and ultimately adapt and improve their efforts.

This guide to Climate-Smart Conservation Practice proposes revisions to Step 1 (Assess) and Step 2 (Plan) of the Conservation Standards. These include assessing the climate vulnerability of ecosystems and species, setting climate-smart goals, and considering various types of climate-smart strategies. Steps 3-5 of the Conservation Standards (Implement, Analyze & Adapt, and Share) remain the same and are

FIGURE 1. CMP CONSERVATION STANDARDS CYCLE VERSION 4.0

only described briefly in this manual. Once conservation practitioners have more experience applying Climate-Smart Conservation Practice, we will have more to say about these later steps. For more information about the Conservation Standards, see the original Conservation Standards document and additional resources listed in Annex 1.

Climate-Smart Conservation Practice consists of the following steps (** = includes a significant amount of new climate-smart content * = includes some new climate-smart content):

ASSESS

- Step 1A. Preconditions and Team
- Step 1B. Define Your Scope, Vision, and Targets
- Step 1C. Describe the Current Status of Conservation Targets
- Step 1D. Identify Conventional Threats
- Step 1E. Understand the Vulnerability of Ecosystems, Species, and People to Climate Change**
- Step 1F. Prioritize Threats*
- Step 1G. Complete the Situation Analysis

PLAN

- Step 2A. Re-evaluate Your Scope and Targets and Set Goals**
- Step 2B. Select Climate-Smart Strategies**
- Step 2C. Develop Theories of Change and Monitoring Plan*

IMPLEMENT

- Step 3. Implement Your Strategies

ANALYZE & ADAPT

- Step 4. Analyze & Adapt

SHARE

- Step 5. Learn & Share

This manual describes each of the steps needed to apply **Climate-Smart Conservation Practice**, 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.

Guidance on how to apply each step of the Conservation Standards is available on the resources page of the Conservation Standards website.[4] Also, the Conservation Coaches Network (CCNet)[5], a global network of conservation professionals who help conservation teams apply the Conservation Standards to their projects, has many resources for "coaches" (facilitators). Finally, a custom-made, affordable software called Miradi[6] supports the application of the Conservation Standards.

Introduction

4 https://cmp-openstandards.org/resources/
5 www.ccnetglobal.com
6 www.miradi.org

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Step 1A. Preconditions and Team

Preconditions for Applying Climate-Smart Conservation Practice

Before embarking on a Climate-Smart Conservation Practice planning process, you should evaluate the need, added value, and feasibility of completing the full, or even partial, approach. It is crucial to have the involvement and support of planning facilitators, experts, project staff, and possibly community leaders and members. Usually, a small **core team** leads the climate-smart planning process. During the pre-planning phase, your team needs to ensure that you have all necessary resources and capacity for the process.

Whether or not you should engage in the full process depends on the type and time horizon of your project. If you are investing in the conservation of a place, a region, or a species over the long term, then this methodology is appropriate. This approach may not be useful, however, if you are implementing a short-term project or focusing on building the enabling conditions needed for biodiversity conservation, such as institutional capacity or conservation policies. To help project teams decide whether a climate-smart planning process is necessary, feasible, and useful in a given situation, Figure 2 includes a decision tree based on critical questions.

Hint: Before planning begins, it is crucial to determine to what extent this approach is useful and feasible, given the needs and capacities of the planning team.

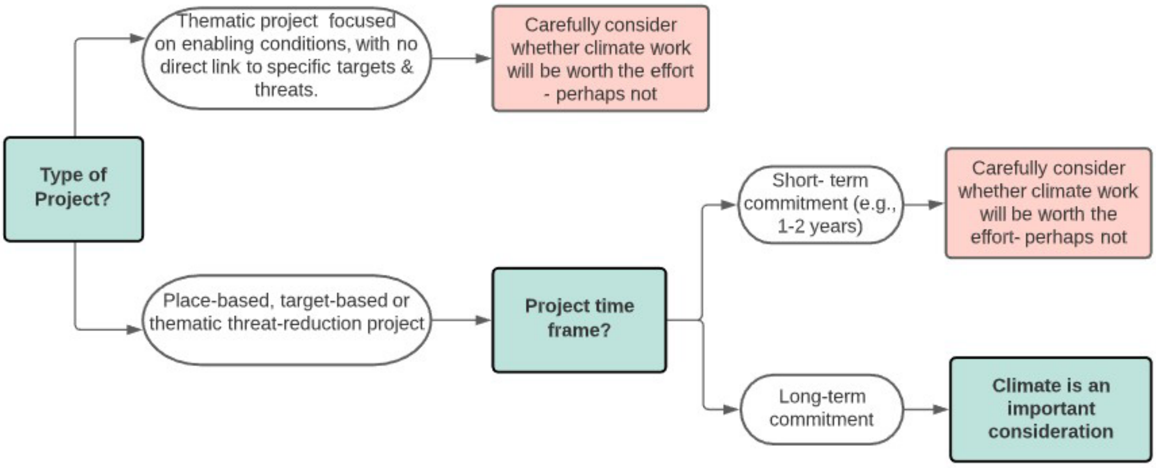
Who to Include on the Team

You will need a core team to lead the planning process. The core team should include:

- conservation practitioners who are working to protect the ecosystems and species of interest
- at least one trained and experienced facilitator, who may be a representative from a local conservation or development organization, to guide the planning process
- (if possible) a climate scientist who can oversee the incorporation of available climate projections (who could participate remotely, if necessary)
- other stakeholders and experts (such as ecologists, social scientists, community members, or government representatives), as needed, to provide inputs and shape the outcome of the process

The core team is responsible for gathering information to support the planning process, preparing workshops, and generally serving as a liaison between the facilitator, outside experts, and stakeholders. The skills and knowledge needed on the planning team are illustrated in Figure 3.

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



Baseline Information to Gather

Before beginning to plan, gather information to support the planning process. This should include information about the ecosystems and species of interest, **ecosystem services, threats,** and climate information from conservation organizations' reports, government studies, academic research, and other sources of information about the project area (see Box 1). This baseline information should be as quantitative and geographically explicit as possible.

KEY TERMINOLOGY

CORE TEAM: A small group of conservation practitioners, a trained facilitator, and other stakeholders and experts who take charge of the planning process.

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

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

THREAT: A human activity that directly or indirectly degrades one or more targets. Typically tied to one or more stakeholders.

BOX 1.

USEFUL BASELINE INFORMATION

- Area and distribution of ecosystems and species of interest
- Area and distribution of areas supporting **livelihoods** or protecting against natural hazards (e.g. map of pastures, agricultural fields, forests, bodies of water)
- Known conventional (non-climate) threats to ecosystems and species (e.g., unsustainable resource use, conversion to other uses)
- General description of historic climate, including trends in monthly and seasonal temperatures, precipitation, and seasonality (wet season, dry season, periods of increased storm activity)
- Type and frequency of observed natural hazards (e.g. landslides, floods, droughts)
- 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?

Site or Project Managers

Who: those who manage area or project

Role: in charge of planning and implementation, assist in consensus building, and provide practical and thematic input

Stakeholder Representatives

Who: local people representing various stakeholder interests

Role: provide key inputs for planning, help shape outcomes

External Experts

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

Role: provide technical information before planning, serve as a resource during the planning process

Facilitators

Who: people trained in the planning method and facilitation

Role: guide the planning process

Step 1B. Define Your Scope, Vision, and Conservation Targets

Define Project Scope

It is important to clearly define the scope of your project – i.e. the broad geographic or thematic focus. A project scope may be either place-based (geographic), **conservation target**-based (focusing on an ecosystem or species), or thematic-based (designed to address specific threats, opportunities, or enabling conditions). Examples of a place-based scope include protected areas, natural resource management areas, watersheds, or jurisdictions. Examples of projects with a target-based scope include a salt marsh conservation initiative, a coral reef conservation program, and the Save the Tiger Fund. Examples of thematic scope include projects to reduce bycatch from fishing, to address deforestation due to palm oil production around the world, and to convince consumers to use certified timber products. The distinction between these types is about the *primary* scope – a place-based project can still focus on a few high priority threats or highly effective strategies, and a thematic-based project usually still has a defined geographic area.

KEY TERMINOLOGY

CONSERVATION TARGET: An element of biodiversity (species, habitat, or ecological system) at a project site on which a project has chosen to focus.

SCOPE: The broad parameters or boundaries (place-based, target-based, or thematic-based) of a project.

VISION STATEMENT: A general statement of the desired state or ultimate condition that a project is working to achieve.

How to Define Your Project Scope

Sometimes, a project's scope is obvious. If you are working to conserve a protected area or manage a watershed, then the scope of your project is defined by the geographic boundaries of the protected area or watershed, respectively. The scope of a conservation target-based project is usually defined by the geographic scope of the ecosystem or species (e.g., all coral reefs in the United States) or a portion of it (e.g., tigers in India).

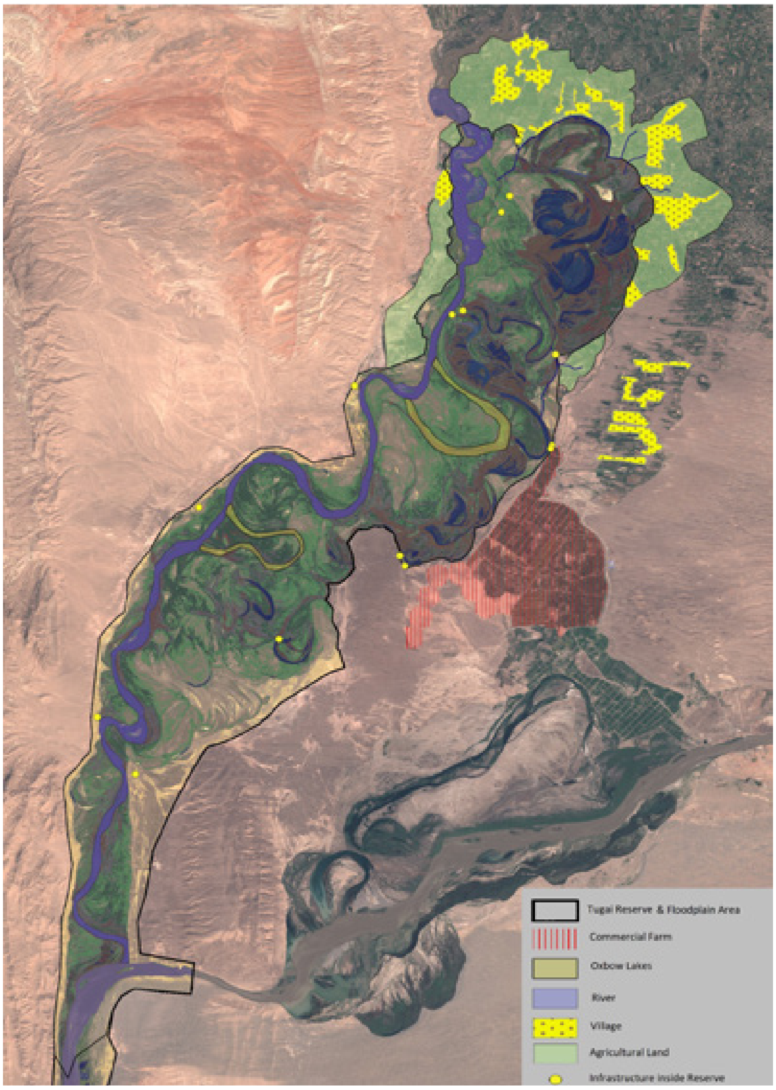
In some cases, however, the project team will need to decide whether or not to include specific elements of a geographic or conservation target-based scope (e.g., just the core zone of a protected area, only the tropical savannahs of Brazil, only the wintering habitat of Kirtland's warbler). For projects with a thematic scope, defining the precise scope will usually require that the planning team analyze what they are trying to achieve. For example, a project team working to reduce cheetah trafficking will need to consider where they can best intervene in the supply chain – e.g., launching a behavior change campaign targeted at consumers in the Middle East, or disrupting the supply by working with farmers in East Africa to reduce human-wildlife conflict. Either scope is valid but they will lead to very different projects.

If possible, you should develop a map to document the boundaries of your project scope. The process of developing the map may help you to decide what areas to include (e.g., buffer zones and other areas of influence around a protected area, both nesting and foraging areas of a seabird species, etc.).

Example of a Project Scope

Figure 4 shows a map of the Tugai Strict Nature Reserve, a reserve in Central Asia created to conserve tugai riparian forest. The map is based on the Tigrovaya Balka Nature Reserve in Tajikistan, which we used as the basis of the example project throughout this guide. We have adapted (simpli-

FIGURE 4. MAP OF THE TUGAI STRICT NATURE RESERVE IN CENTRAL ASIA



(Source: Michael Succow Foundation)

The map is based on the Tigrovaya Balka Nature Reserve in Tajikistan and has been adapted to show a general example of a project scope map.

fied) many details of the reserve, including this project scope map, to help readers to understand the Climate-Smart Conservation Practice methodology. In this example, the project scope (black outline) includes a river, tugai riparian forest on both sides of the river, oxbow lakes and wetlands, and infrastructure within the reserve. Outside of the reserve the map also shows surrounding villages, agricultural land used by local people, and commercial farms.

Define Project Vision

A **vision statement** is a description of the desired general state or ultimate condition that a project is working to achieve (in many cases with other organizations). A vision statement is not mandatory, but many projects find it very useful to forge a common position on the overall direction of the project. A climate-smart project vision statement would commonly include references to the resilience of ecosystems, species and ecosystem services, and the human communities that depend on them, in the face of climate change (or change in general).

How to Define Your Project Vision

We recommend involving your full planning team in brainstorming key phrases to include in the project vision and then tasking 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. We caution against wordsmithing your project vision with a large group of people, because this can be time-consuming and tedious.

Example of a Project Vision

The ecologically outstanding lowland riparian (tugai) forests, wetlands, and associated ecosystems of the Tugai Strict Nature Reserve with their iconic populations of Bukhara Deer are preserved in perpetuity, in spite of observed and projected climate change impacts. This provides a prime example of an emblematic element of Central Asia's natural heritage, for the benefit of local communities, the people of the entire country, and the global scientific and conservation community.

BOX 2.

CRITERIA FOR A GOOD VISION STATEMENT

- *Relatively general* - broadly 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 1B.

Define Conservation Targets, Ecosystem Services, and Human Wellbeing Targets

The purpose of a conservation project is to help conserve ecosystems and species within the scope of the project. For many projects, it is also important to identify ecosystem services, the ecosystems that provide them, and what aspects of human wellbeing these ecosystem services are supporting. We recommend that all planning teams spend some time identifying the ecosystem services and **human wellbeing targets** that depend on their conservation targets.

Conservation Targets

A conservation target is an element of biodiversity (species, habitat, or ecosystem) on which a project has chosen to focus. An ecosystem is defined as "all the plants and animals that live in a particular area, together with the complex relationship that exists between them and their environment."[7] Examples of ecosystems (and their associated species) include forests (with associated timber and non-timber forest products), grasslands, rivers (and associated fish), wetlands (and associated waterfowl), coral reefs, mangroves, and beaches. In some cases, conservation targets may also include managed ecosystems, such as orchards and pastures.

Ecosystem Services

Ecosystem services are the benefits people derive from ecosystems. 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 sustained, can contribute to **ecosystem-based adaptation** for communities, for example by buffering against the impacts of more frequent extreme weather events, temperature extremes, sea-level rise, and other expected changes in climate.

Although classifications vary and are not critical for our purposes, there are four commonly referenced

EXAMPLES OF TYPES OF ECOSYSTEM SERVICES

BOX 3.

Type of Ecosystem Service	Examples
Provisioning services	■ wild foods, spices, and medicinal plants ■ raw materials, including lumber, skins, and fodder ■ water ■ fuelwood, hydropower, and biomass fuels
Regulating services	■ carbon sequestration and climate regulation ■ flood control ■ slope stabilization ■ purification of water and air
Cultural services	■ use of nature for religious or heritage value ■ ecotourism, outdoor sports, and recreation ■ science and education
Supporting services	■ habitat provision and pollination ■ primary production (e.g., phytoplankton, algae) ■ soil formation

7 https://www.collinsdictionary.com/dictionary/english/ecosystem

KEY TERMINOLOGY

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

HUMAN WELLBEING TARGET: Those components of human wellbeing affected by the status of conservation targets.

categories of ecosystem services: supporting, provisioning, regulating, and cultural services. Box 3 has examples of each category.

Human Wellbeing Targets

Human wellbeing targets are defined as those aspects of human wellbeing affected by the status of conservation targets. The Millenium Ecosystem Assessment[8] outlines five dimensions of human wellbeing:

- 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.

If relevant, project teams should identify all of the aspects of human wellbeing 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. Health and security from natural disasters frequently depend on regulating services, such as water and air purification, soil stabilization, and flood control.

The objective in this step is to visualize the importance of and linkages between ecosystems, ecosystem services, and human wellbeing. More guidance about these linkages is available in CMP's document on Incorporating Social Aspects and Human Wellbeing in Biodiversity Conservation Projects.[9]

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

9 https://cmp-openstandards.org/library-item/addressing-human-wellbeing/

How to Define Conservation Targets, Ecosystem Services, and Human Wellbeing Targets

Step 1B.

1. Identify the Conservation Targets

Defining conservation targets for a conservation target-based project should be straightforward (e.g., if your project is about conserving argali sheep, the target is the sheep, plus their habitat). For a geographic project, this step may be more challenging. You should work with your planning team to identify 8-10 ecosystems and species that, together, represent the biodiversity of the area. Begin by identifying the dominant, widespread ecosystems, with the assumption that conserving those ecosystems will conserve most or all of the species in them. Then add minor ecosystems and species (or groups of species) that face threats not associated with habitat destruction or degradation, such as unsustainable hunting or fishing. Potential examples of such

FIGURE 5. ECOLOGICAL DRAWING OF TUGAI RIPARIAN FOREST AND ASSOCIATED ECOSYSTEMS

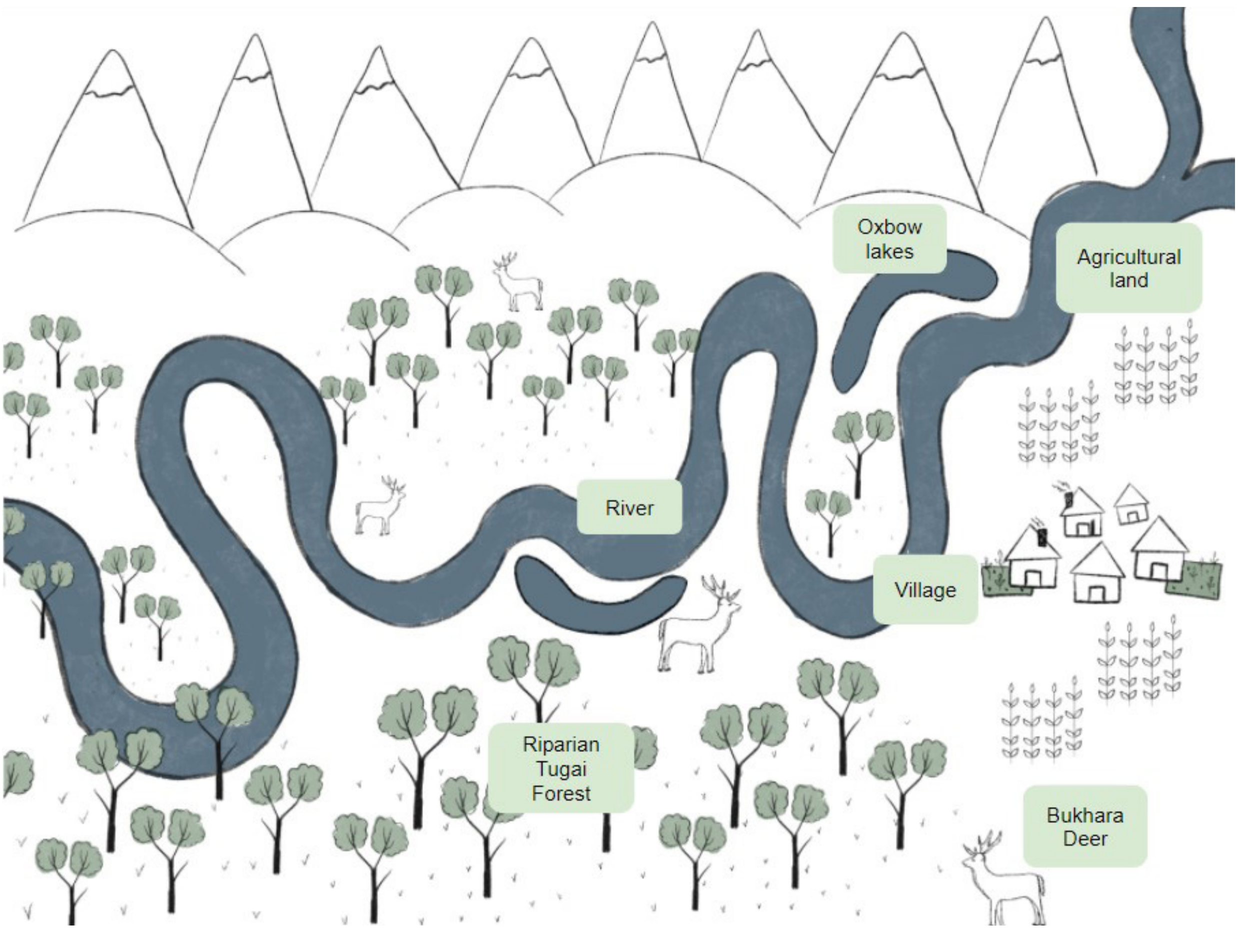
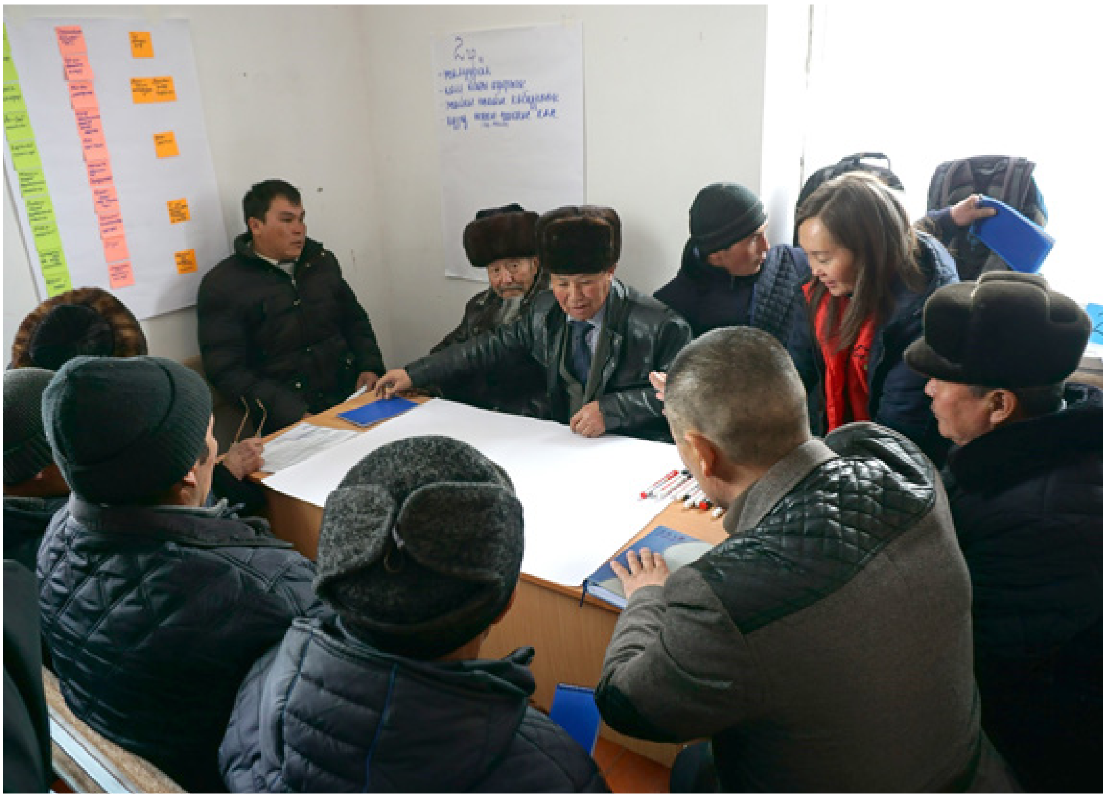


FIGURE 6. A TEAM IN BASH KAIYNDY, KYRGYZSTAN DISCUSSING TARGETS AND ECOSYSTEM SERVICES



© John Morrison

species in Central Asia include saiga antelope, argali, snow leopard, and various sturgeon species.

As an input into this discussion, we recommend that the core team develop an initial list of ecosystems and species, based on a review of documents and/or interviews, and refine this list with the full planning team in a workshop. Another option is to develop the draft list with the planning team during a workshop.

The conservation targets for a thematic project may be specific (e.g., if the project's objective is to stop the poaching of snow leopards, the conservation target is snow leopards, plus perhaps its habitat and prey species). They may also be more general. For example, if the project's objective is to increase the management effectiveness of Mongolia's protected area network, the conservation targets should describe the main high-level ecosystems in Mongolia.

Developing an ecological drawing as a team can help identify possible conservation targets. As shown in Figure 5, an ecological drawing is a drawing of the project scope that includes the main ecosystems (in this case, forests, rivers, grasslands, etc.) and communities.

2. Lump, Split, and Select Your Conservation Targets

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

In our example project from Central Asia, the team identified the following conservation targets: the tugai forest, Bukhara deer (*Cervus elaphus bactrianus*), the river, oxbow lakes, and the native fish community.

3. Develop a Map of the Conservation Targets

It is helpful to develop a map of the scope and conservation targets. You can draw a map by hand (potentially building on the ecological drawing, Figure 5), use a Google map, or develop one with GIS software. Either way, the product will help clarify the conservation targets and project scope. Be sure to use existing ecosystem or vegetation maps as a reference.

4. Use Targets to Refine Your Project Scope

Frequently, teams can adjust their original project scope based on a more complete understanding of their conservation targets. For instance, a conservation team might prioritize conservation of tugai riparian forest over conservation of the adjacent semi-desert ecosystem and therefore restrict the project's scope to the forested area, rather than the entire reserve.

5. Identify Ecosystem Services and Related Human Wellbeing Targets

The aim of this step is to identify the ecosystem services that humans obtain from the conservation targets and the elements of human wellbeing that are dependent on these ecosystem services. Review the list of types of ecosystem services in Box 3 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. Even if human wellbeing is not a central element of your project, identifying ecosystem services and human wellbeing targets may help you to understand how people will react to climate change.

Because you will be drawing linkages from the conservation targets to ecosystem services and then to the human wellbeing targets, we recommend using flipchart paper, sticky notes, and index cards to complete this step (Figure 6).

As shown in Figure 7, the river and oxbow lakes in our example project provide fisheries resources that contribute to food security. The tugai forest, river, and Bukhara deer offer cultural ecosystem services by supporting recreation and pride in the natural heritage. This pride might contribute to physical and mental health, tourism income and employment, and social cohesion. In its entirety, the tugai riparian forest acts as a natural buffer that regulates river run-off, as well as sediment and nutrient concentrations in the downstream river. These regulatory ecosystem services contribute to safety from destructive flooding, and to productive agriculture.

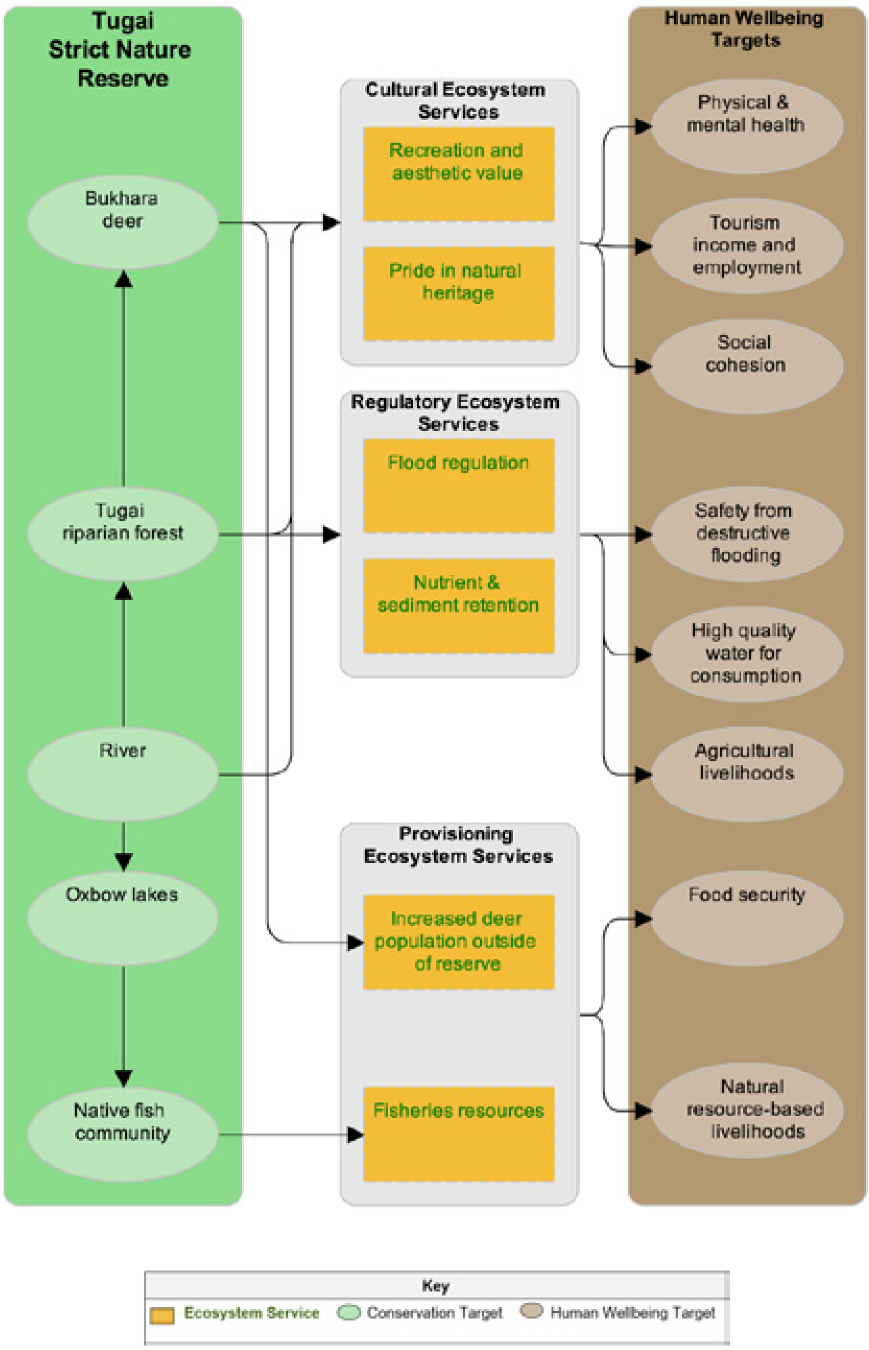
Hint: Remember to think beyond provisioning ecosystem services that provide marketable resources and include other categories of ecosystem services, such as regulating services – e.g., slope stabilization by a forest.

6. Document Your Work

Once the planning team has defined the conservation targets, ecosystem services, and human wellbeing 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 7 was produced using Miradi. See Annex 1 for more information about Miradi.

Example of Ecosystem Targets, Ecosystem Services, and Human Wellbeing Targets

FIGURE 7. EXAMPLE CONSERVATION TARGETS, ECOSYSTEM SERVICES, AND HUMAN WELLBEING TARGETS



Step 1C. Describe the Current Status of Conservation Targets

Describe the Current Status of Conservation Targets

To design effective strategies, you must know the current status (**viability** or 'health') of your conservation targets. This step is referred to as viability assessment in the Conservation Standards. You need to understand each conservation target's structural and functional intactness and resilience in the face of both conventional threats and climate change threats, to the extent possible. **Key ecological attributes** (KEAs) are aspects of a conservation target's biology or ecology that, if within an acceptable range, define a healthy conservation target and, if outside that range, would lead to the loss or degradation of that target. Defining KEAs helps teams to describe the current status of the conservation target.[10]

KEAs also provide a measure by which to gauge adaptive capacity of your conservation targets. If a target has healthy KEAs, it is more likely to withstand the stresses caused by climate change. 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. If the forest is already struggling to regenerate, it will likely suffer more extensive damage from changes in precipitation and temperature.

KEY TERMINOLOGY

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

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 accumulation).

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

KEY ECOLOGICAL ATTRIBUTE (KEA): Aspect of a conservation target's biology or ecology that, if present, defines a healthy target and, if missing or altered, would lead to the outright loss or extreme degradation of that conservation target over time.

10 The guidance provided in this chapter draws heavily from Planning for Conservation: A Conservation Standards How-to Guide (FOS 2020). For more detailed guidance, please see the chapter on Defining Viability Status. https://spark.adobe.com/page/6XaDPKyVSjTfU/

How to Describe the Current Status of Conservation Targets

1. For Each Conservation Target, 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 altered, would jeopardize the target's ability to persist. Because teams often have limited capacity for monitoring, you should focus your KEAs on the most indicative components of the ecosystem's health. For further discussion and classification of KEAs, see Schick et al. (2019).

There are three types of KEAs – size, condition, and landscape context (Table 1). Generally, one or several size and/or condition KEAs are necessary to fully understand a target's health. Some ecosystems, such as fire-dependent forests and floodplain forests, are particularly dependent on ecological processes that should be captured as landscape context KEAs (fire regime, hydrologic regime, etc.). Connectivity between ecosystems is also a landscape context KEA.

2. Select Indicators to Monitor Changes in These KEAs

You will need to measure an indicator for each KEA regularly to determine if the current ecosystem status is improving or declining. In some cases, the indicator will be similar to the attribute itself (e.g., an attribute of 'area of forest' may have an indicator of 'number of hectares of forest'). In many cases, you can measure a KEA using just a single indicator.

TABLE 1. TYPES OF KEY ECOLOGICAL ATTRIBUTES WITH EXAMPLES

Type	Definition	Examples
Size	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 an ecosystem or capacity of a species to meet its basic needs	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) Condition of foraging habitat Reproductive rate
Landscape context	Measure of the 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 4.

- *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

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. 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 or whether specific macroinvertebrates are present in a stream, indicating high water quality.

Criteria for good indicators are included in Box 4. It is worth noting that these criteria apply to indicators linked to KEAs, as well as indicators linked to objectives along a results chain, which we will discuss in Step 2C.

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 5). This is the range of variation for each KEA indicator that would allow the ecosystem to persist over time. Within this range, we would say the attribute has good or very good status. 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.

The ratings may be more or less precise, depending on the nature of the KEA and the level of background information that your team has. If you have little information on the acceptable range of variation of a specific indicator, 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. In our example for tugai riparian forest (Table 3), a "good" level of regeneration of the dominant forest species (*Populus pruinosa*) can be measured quantitatively based on the density of saplings. If this is not feasible to measure, however, the team could qualitatively assess whether seedlings and saplings are seen regularly or often.

Defining these ranges is the most challenging step in viability assessment. Do the best you can with the information available and don't get bogged down. As your team becomes more familiar with your conservation targets through research or monitoring, you can refine the thresholds.

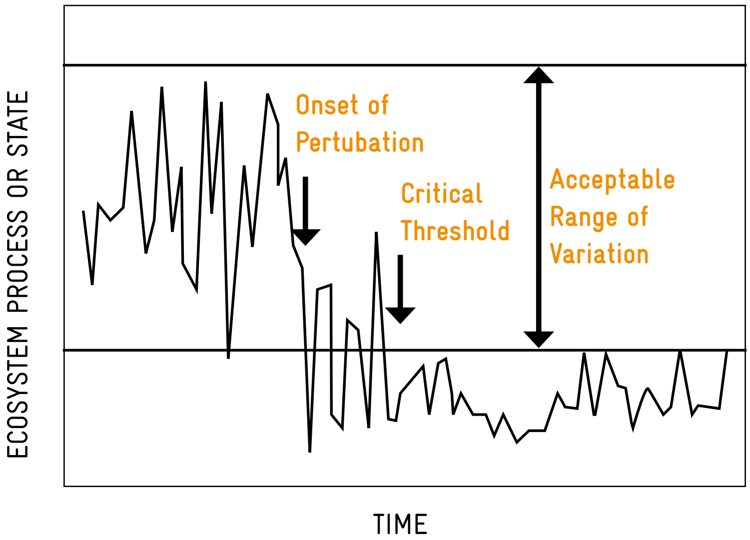
4. Determine the Current Status of the Conservation Targets

Tables 2-4 show how to use the ranges to indicate the current status of a conservation target. If you do not have baseline data, you may need to make an informed estimate about the ecosystem's current status.

USING ACCEPTABLE RANGE OF VARIATION FOR DECISION MAKING

BOX 5.

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.



The viability assessment methodology includes the following qualitative categories for defining the "acceptable" range for each indicator that will allow the target to persist over time:

- **Very Good** – Ecologically desirable status; requires little intervention for maintenance
- **Good** – Indicator within acceptable range of variation; some intervention required for maintenance
- **Fair** – Outside acceptable range of variation; requires human intervention
- **Poor** – Restoration increasingly difficult; may result in extirpation of target

5. Repeat Steps 1 - 4 for the Other Conservation Targets

In a subsequent step – but after assessing the vulnerability of your conservation targets to climate change – you can use this rating system to also define the desired (and achievable) future status of each target. This is included in Step 2A. Re-evaluate Project Scope and Targets and Set Goals.

Step 1C.

TABLE 2. EXAMPLE OF QUANTITATIVE AND QUALITATIVE RATING SCALES FOR A KEA IN THE "SIZE" CATEGORY

				Indicator ratings			
Conserva-tion Target	**Category**	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**
Example of Quantitative Rating							
Tugai riparian forest	Size	Area of Tugai forest	% of the area within 500 meters of the river that is forested	< 25%	25-50%	51-75%	> 75%
Current status of indicator					40%		
Example of Qualitative Rating							
Tugai riparian forest	Size	Area of Tugai forest	Forest cover along the river		Substantial parts not forested	Most parts moderately to well forested	
Current status of indicator					Substantial parts not forested		

TABLE 3. EXAMPLE OF QUANTITATIVE AND QUALITATIVE RATING SCALES FOR A KEA IN THE "CONDITION" CATEGORY

				Indicator ratings			
Conserva-tion Target	**Category**	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**
Examples of Quantitative Rating							
Tugai riparian forest	Condition	Regeneration of *Populus pruinosa*, the dominant species	Density of 3-yr saplings per m^2	< 0.1	0.1-1	1-5	>5
Current status of indicator				0.05			
Tugai riparian forest	Condition	Soil salinity	Electrical conductivity of soil solution (mS/m)	> 400	201-400	50-200	< 50
Current status of indicator				450			

TABLE 3. CONTINUATION

Conservation Target	Category	KEA	Indicator	Indicator ratings: Poor	Fair	Good	Very good
Examples of Quantitative Rating							
Tugai riparian forest	Condition	Regeneration of *Populus pruinosa*, the dominant species	Density of saplings/ seedlings		No or few saplings/ seedlings found	Saplings/ seedlings regularly or often found	
Current status of indicator					No or few saplings/ seedlings found		

TABLE 4. EXAMPLE OF QUANTITATIVE RATING SCALE FOR A KEA IN THE "LANDSCAPE CONTEXT" CATEGORY

Conservation Target	Category	KEA	Indicator	Indicator ratings: Poor	Fair	Good	Very good
Tugai riparian forest	Landscape context	Intensity of seasonal flooding	# of days per year with submerged forest surface (standard sample sites)	< 10	10-25	25-50	> 50
Current status of indicator					16		

Below is an additional example of a **viability assessment**, in this case for the Bukhara deer (Table 5). The ranges for poor, fair, and good include not only a minimum number of deer but also a maximum, since too many deer lead to overbrowsing of vegetation.

TABLE 5. EXAMPLE OF A VIABILITY ASSESSMENT FOR BUKHARA DEER

Conservation Target	Category	KEA	Indicator	Indicator ratings: Poor	Fair	Good	Very good
Bukhara deer	Size	Population size	# of mature individuals per km^2 in the reserve	<0.15 >0.60	0.15-0.25 0.50-0.60	0.25-0.35 0.45-0.50	0.35-0.45
Current rating							0.365

Step 1D. Identify Conventional Threats

Climate change does not affect ecosystems and communities in isolation, but adds to and often interacts with conventional (non-climate) threats. For example, river flow may be very low during the summer or dry season, due to diversion of water for agriculture; drought due to climate change will exacerbate the impact of water diversion.

Before assessing the current and/or potential impacts of climate change, we recommend that you 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).[11]

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., increased predation due to proximity of 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).

To ensure that you are including all of the conventional threats affecting your conservation targets, you could browse the IUCN-CMP Unified Classifications of Direct Threats.[12] This taxonomy can also help you classify your threats, which could help you to find other teams working to address the same threat. This taxonomy includes a section on direct threats caused by climate change that will be useful for Step 1E. "Understand the Vulnerability of Ecosystems, Species, and People to Climate Change ".

How to Identify Conventional Threats (and Stresses)

1. For Each Conservation Target, Define the Conventional Threats Affecting It

Beginning with one of your conservation targets, define the most important conventional (non-climate) threats currently affecting that conservation target. Where relevant, you should also include potential threats that could affect your conservation targets in the next 10 years. Questions to keep in mind include:

- What human activities are currently taking place in your project scope, and how do they affect your conservation targets?
- Who is conducting these activities?
- Are there any new activities that are likely to take place during the next decade that could significantly affect your targets?

It is best to limit the number of conventional threats affecting all of your conservation targets to 10, or fewer if possible, in order to keep the project manageable. To do this, you may choose to lump

11 The guidance provided in this chapter draws heavily from Planning for Conservation: A Conservation Standards How-to Guide (FOS 2020). For more detailed guidance, please see the chapter on Identifying and Prioritizing Direct Threats. https://spark.adobe.com/page/6XaDPKyVSjTfU/

12 https://cmp-openstandards.org/library-item/threats-and-actions-taxonomies/

EXAMPLES OF CONVENTIONAL THREATS AND STRESSES

BOX 6.

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

Direct Threat	Example Stress	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

some threats – for example, clear-cutting and poor forest road construction 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 the local government has done a poor job siting and constructing roads for timber harvesting), then you would need to use different strategies to address them, and it would be best to separate them. In our example project, the team distinguished between illegal and unsustainable fishing in the reserve and the introduction of exotic invasive species; both threats are affecting native fish populations, but they have different root causes and the strategies to address them will be different (Figure 8).

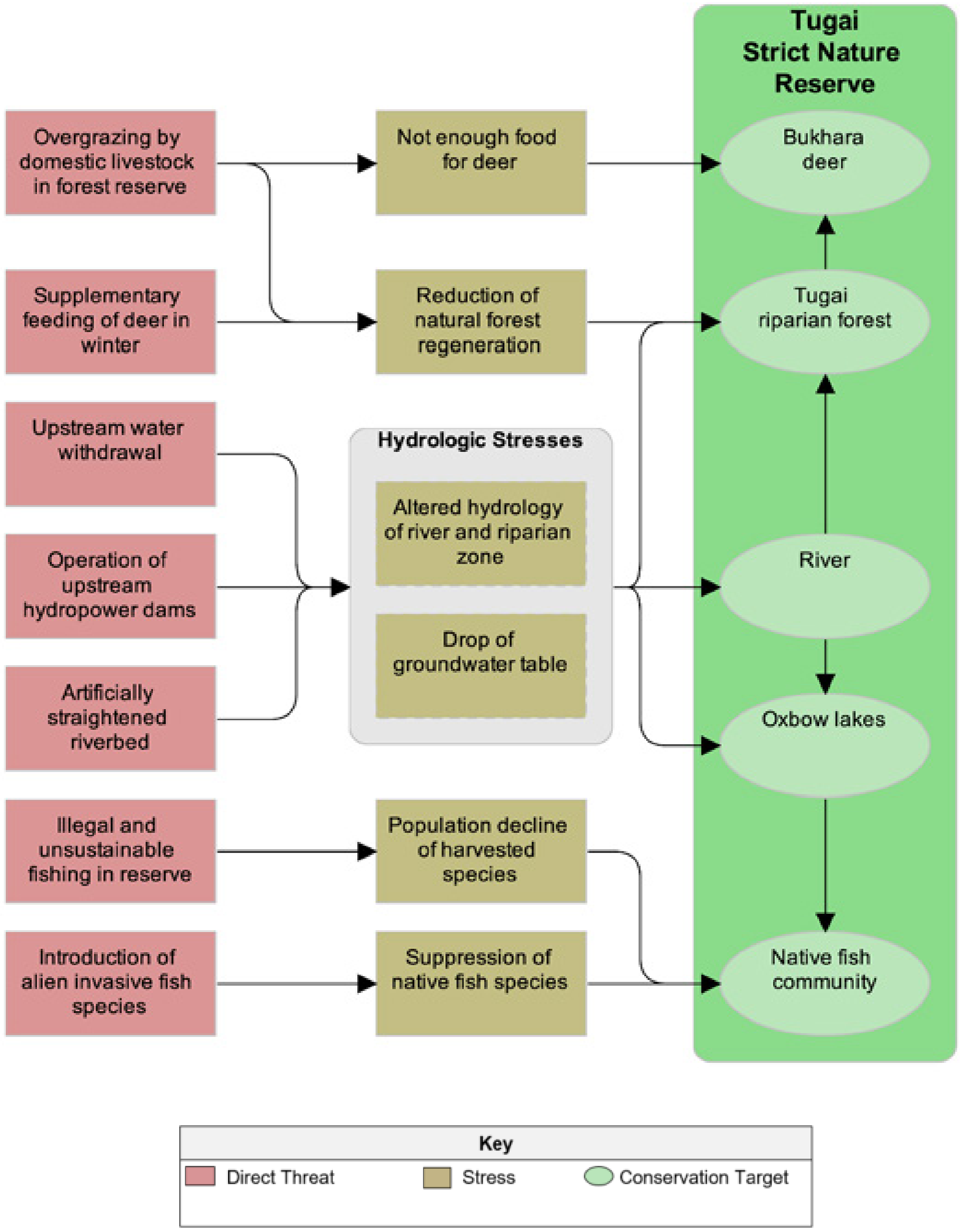
2. (Optional but Recommended) Include Stresses to Clarify How the Conventional Threat Affects the Target

For clarity, you may need to include stresses that describe the biophysical impact of the threat on the conservation target. For example, it may not be immediately clear how feeding deer in the winter affects the tugai riparian forest. If we know feeding in the winter leads to unnaturally high deer populations which reduce forest regeneration, it can be helpful to include these stresses so all stakeholders share a common understanding of the situation (Figure 8). However, including too many stresses will quickly complicate your situation model, so we recommend using stresses only when needed to describe complex or unclear relationships between the conventional threats and conservation targets.
There is often confusion between direct threats and stresses. The examples in Box 6 can help you to clearly distinguish between them.

KEY TERMINOLOGY

STRESS: An impaired aspect of a conservation target that results directly or indirectly from conventional threats or climate change. Examples of stresses include low population size, reduced river flow, increased sedimentation, and reduced groundwater table level. A stress is also generally equivalent to a degraded key ecological attribute.

FIGURE 8. EXAMPLE OF CONVENTIONAL THREATS AND STRESSES AFFECTING CONSERVATION TARGETS



Step 1E. Understand the Vulnerability of Ecosystems, Species, and People to Climate Change

Define Climate Scenarios

In the previous step, you worked to understand the range of conventional (non-climate) threats to your conservation targets. The next step is to understand how climate change may either directly or indirectly affect these ecosystems and species. In the climate change community of practice, the process of gaining this understanding is called a **climate vulnerability assessment**.

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 a 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.

In some cases, climate models generally agree on specific parameters (e.g., amount of temperature increase, increased frequency and intensity of extreme storms) and thus produce predictions. When there is little or no uncertainty, it is not necessary to develop climate scenarios for those parameters, but they need to be taken into account in all of the **climate scenarios** used for strategy development. <u>If there is little uncertainty about any of your climate parameters, then you will not need to consider multiple scenarios in your planning.</u>

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 Develop Climate Scenarios for the Project Area

If scenario planning is justified by your planning situation, we recommend a stepwise approach. This involves identifying important climate variables with high uncertainty (such as changes in temperature and precipitation) and combining them to define climate scenarios – e.g., “dry desert” (hot and dry) and “tropical swamp” (warm and wet). The team then describes the ecological and socioeconomic impacts of these scenarios on the scope and targets. 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 (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, and holidays). 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). It can help teams identify critical times when climate change may have a significant effect on ecosystems, species, and natural resource management. For example, in many temperate regions, insectivorous birds strongly depend on dry weather while feeding their young in early summer. Rain during this time can cause critical declines in food availability and hence reproduction rates.

Developing a seasonal calendar can help you to understand both historical climatic conditions and the changes in climate that the planning team and local stakeholders have begun to perceive. Figure 9 shows an example from Sweden. We recommend using four different colored cards, as this team did: yellow for changes in climate (primarily temperature and precipitation, as well as day length), green for ecological changes (e.g., migration, hibernation, etc.), orange for natural resource management and recreational activities (e.g., planting and harvesting crops, fishing, field research, hiking, and tourism), and pink for important cultural events (e.g., the beginning and end of the school year, important holidays, and celebrations).

2. Discuss Observed Changes in Climate

Ask local managers, site custodians, or other stakeholders to describe the climate changes that they have observed to date. Have they observed any of the following?

KEY TERMINOLOGY

CLIMATE VULNERABILITY: The potential of an ecosystem, species, or human community to be harmed by climate change. It can be defined as a function of the exposure of an ecosystem or community to a climate change related hazard, its sensitivity to it, and its adaptive capacity (Box 10).

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

(CLIMATE) SCENARIO: 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 conservation targets in order to identify uncertainty and plan climate-smart strategies, 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 given time frame. If all GCMs project similar results for a specific parameter (e.g., temperature), then these projections can be considered a prediction.

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, where relevant.

- 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 phenological mismatch (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. For example, in Alaska resource managers have begun to observe prolonged and more intense wildfire seasons, and migratory birds arriving earlier in the spring and leaving later in the fall (see the ecological portion of their seasonal calendar in Figure 10).

Define climate threats (Box 7) to describe the observed climate changes and then discuss the impact they are having on your ecosystems, species, and natural resource management activities. If you document the climate threats and their effects in a different color (e.g., we use red text, as shown below in Box 9), it will be easy to distinguish them from conventional threats.

To make sure that you are capturing different aspects of climate change, look at section 11 of the IUCN-CMP Unified Classifications of Direct Threats,[13] which focuses on climate change. It includes the following five categories of climate threats: (1) ecosystem encroachment (e.g., sea level rise, desertification), (2) changes in geochemical regimes (e.g., ocean acidification), (3) changes in temperature regimes (e.g., increased temperature, more frequent heat waves), (4) changes in precipitation and hydrological regimes (e.g., increased severity of floods), and (5) severe weather events (e.g., thunderstorms, hailstorms).

13 https://cmp-openstandards.org/library-item/threats-and-actions-taxonomies/

WHAT IS A CLIMATE THREAT?

BOX 7.

The Conservation Standards define a direct threat as:

"Primarily human actions that immediately degrade one or more conservation targets (e.g., unsustainable logging, overfishing). 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:

- **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 precipitation as snow, and increased rain in winter)

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 snowfall
- Increased frequency or intensity of storms

FIGURE 9. EXAMPLE FROM SWEDEN OF A SEASONAL CALENDAR

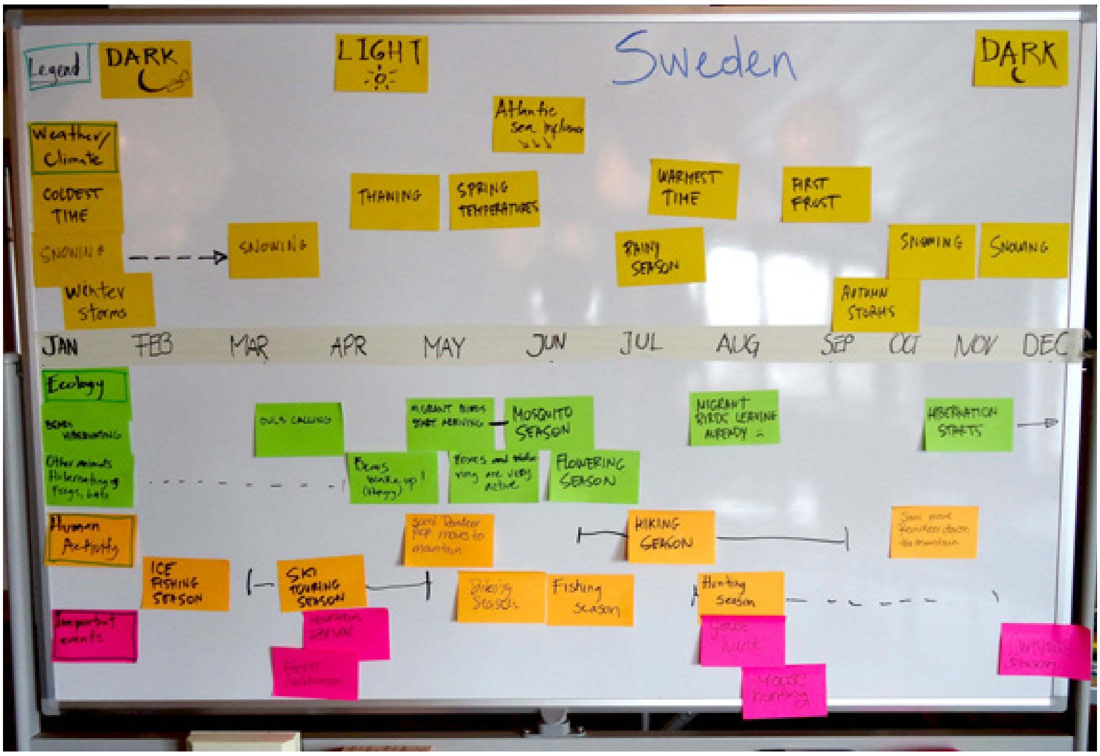
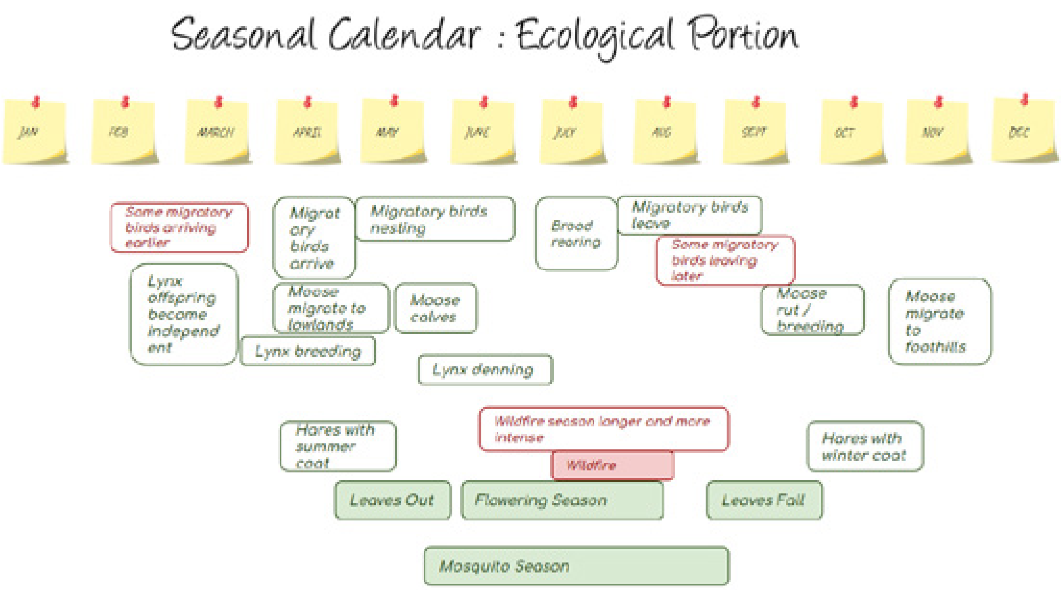


FIGURE 10. ECOLOGICAL PORTION OF A SEASONAL CALENDAR, WITH OBSERVED CHANGES IN CLIMATE



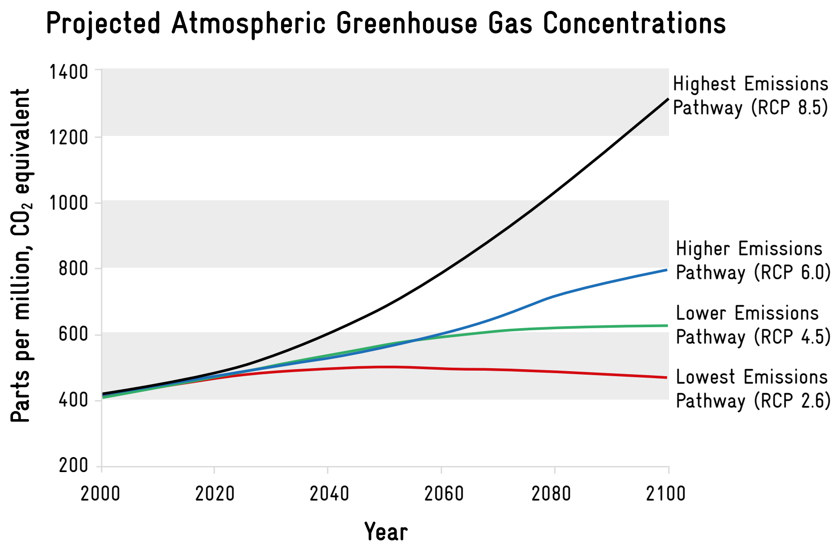
3. Use the Outputs of Several Climate Models, Based on Different Projections of Emissions, to Identify Important Variables with High Uncertainty

Climate models, otherwise known as General Circulation Models (GCMs), use different projections of global greenhouse gas (GHG) emissions by humans and the associated concentrations of those GHG in the atmosphere, called **representative concentration pathways** (RCPs), as inputs. See Box 8 for a description of the four standard RCPs used by the international climate community.

The basic idea of this step is to use the outputs of climate models (based on different RCPs) to identify climate variables that are important for the health of your conservation targets (and people who may react in a way that affects the conservation targets) and for which there is uncertainty (i.e., variability between climate models). 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.

BOX 8.

PROJECTED ATMOSPHERIC GHG CONCENTRATIONS



Source: Figure created by the US Environmental Protection Agency from data in the Representative Concentration Pathways Database (Version 2.0.5)[14]

Climate scientists have defined four standard Representative Concentration Pathways (RCPs) to project possible global GHG emissions by humans and the associated concentration of those GHG 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 GHG emissions (worst case scenario) and 2.6 the least emissions (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.

14 http://www.iiasa.ac.at/web-apps/tnt/RcpDb

Step 1E.

It is essential to carefully consider whether or not you need to consider more than one climate scenario. As shown in the decision tree in Figure 11, in many cases, there is variability between the outputs of climate models. In this case, it is helpful to consider two or more climate scenarios. It is possible, however, that all of the models will agree concerning how much change is expected in the most critical variables, and in this case, you can proceed with just one scenario. 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 should skip steps 3-4 and 6-7 in this chapter.

Frequently, there is variability between the outputs of the models. Some models will indicate that precipitation will increase and some will show 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 local stakeholders) should decide which uncertain variables would be most consequential for the viability of ecosystems and species, as well as the wellbeing of communities that depend on them. We recommend prioritizing no more than two critical variables to avoid overcomplicating the planning. Annex 3 includes advice about how to work with climate scientists and use climate data from general circulation models.

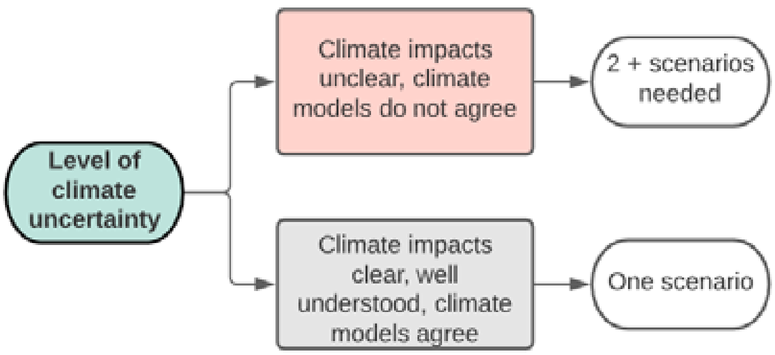
KEY TERMINOLOGY

GENERAL CIRCULATION MODEL (GCM): A numerical model representing physical processes in the atmosphere, ocean, cryosphere, and land surface, for simulating the response of the global climate system to increasing GHG concentrations. GCMs depict the climate using a three-dimensional grid over the globe typically having a horizontal resolution of between 250 and 600 km, 10 to 20 vertical layers in the atmosphere, and sometimes as many as 30 layers in the oceans. Their resolution is thus relatively coarse (Intergovernmental Panel on Climate Change).[15]

It is not absolutely necessary to use new climate modeling data to define the variables in your scenarios. There may be older models documented in a published local or regional vulnerability assessment. The project could also 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.

15 https://ipcc-data.org/guidelines/pages/gcm_guide.html

FIGURE 11. DECISION TREE FOR DETERMINING WHETHER TO CONSIDER MORE THAN ONE CLIMATE SCENARIO



We suggest you look at the outputs from as many climate models as possible, (run using the same RCP) so that you can understand the range of variation for important variables. If climate models are not readily available for your project area through a local government agency or university, we recommend using Climate Wizard,[16] 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 allows users to view historical 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.

The World Bank's Climate Change Knowledge Portal[17] represents another valuable source of climate-related information, data, and tools. The Portal provides an online platform for access to comprehensive climate data at the country, regional, and watershed levels. It contains environmental, disaster risk, and socioeconomic datasets, as well as synthesis products, including Climate Adaptation Country Profiles and Climate-Smart Agriculture Profiles.

16 https://climatewizard.ciat.cgiar.org/

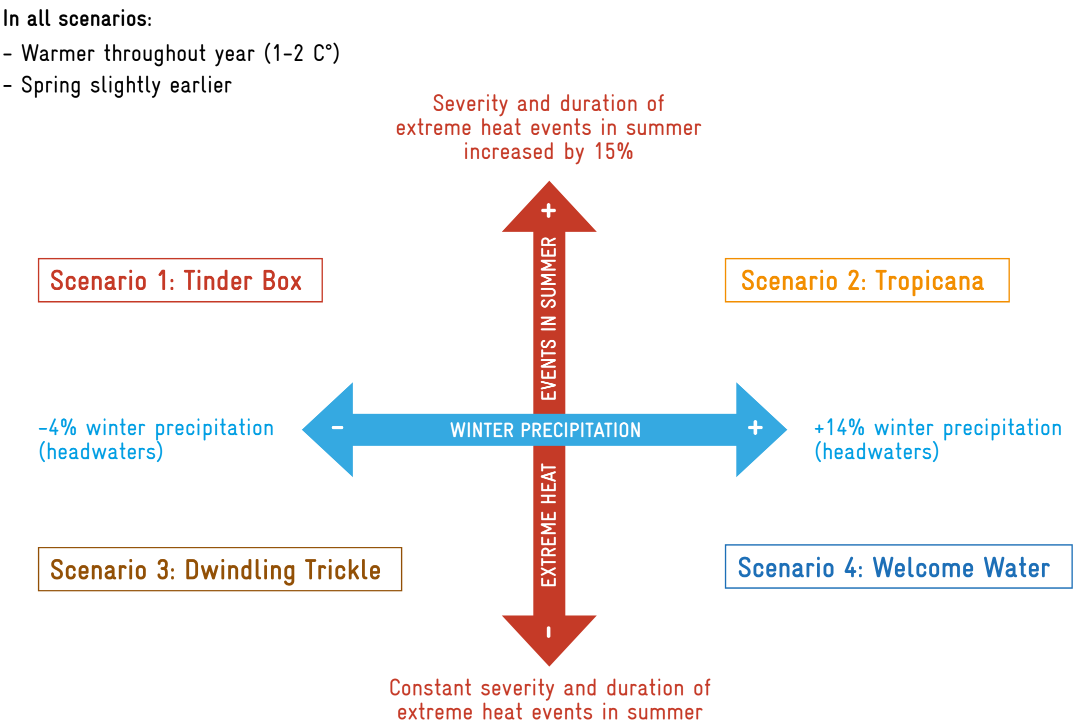
17 https://climateknowledgeportal.worldbank.org/

4. Select Two or More Key Variables with High Uncertainty and Use Them to Construct a Quadrant with Four Scenarios

After examining the climate model outputs, select two important climate variables. These variables should be consequential for your conservation targets (and/or human communities in the area), and they should vary considerably between the climate models. Use these variables to construct a quadrant. The quadrant shown in Figure 12 describes four possible future climates based on just two climate variables (winter 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). Focusing on seasons that are most critical to the viability of your conservation targets (or humans depending on them) 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

FIGURE 12. PARAMETER QUADRANT FOR SCENARIO PLANNING AT TUGAI STRICT NATURE RESERVE



(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 combine climate variables with socioeconomic or political variables, such as the political will to address climate change. Rowland et al. (2014) describe 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.

It is best to give the four scenarios in your quadrant 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 a scenario including wet spring conditions).

5. Describe Each of the Scenarios in the Quadrant

If more than one scenario is needed, your team will need to decide how many scenarios to pursue. Each scenario entails work. Where there is much uncertainty, at least two scenarios are recommended, but the choice is up to your team. For each scenario that you decide to investigate, draw and describe the ecological (and possibly socioeconomic) impacts, plus likely human responses to climate change impacts that might affect your conservation targets. This is the heart of the climate vulnerability assessment – where you consider the consequences of future climate scenarios. Think through each scenario individually, documenting the expected impacts of that scenario in terms of:

- Direct impacts on the viability of 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)
- (If relevant) Direct impacts on humans depending on these ecosystems and species (e.g., increasing temperature and decreasing precipitation will mean that rivers are drier in the summer, causing competition and possibly conflict over limited water for irrigation)
- (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 and degradation of sensitive montane ecosystems)

Update the ecological drawing developed in Step 1B (Figure 5) to include the climate impacts projected for each scenario (Figure 13). Using a separate drawing for each scenario will be clearer than trying to combine several scenarios into one drawing. Begin with the drawing developed earlier that includes all of your conservation targets and 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.

Describe how your conservation targets are likely to be impacted by the relevant changes in climate, how humans are likely to react to the change, and how those reactions may, in turn, affect the conservation targets. In a workshop setting, it is helpful to describe the projected impacts of each climate scenario on flipchart paper, developing a figure like Figure 14 for each scenario. 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 managers and other stakeholders may not have experienced any of the scenarios in full. Still they have usually experienced or heard from their parents and grandparents about elements of the different scenarios in recent history (e.g., extreme weather events, drought, etc.), along with their impacts.

6. 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 diagram. Figure 15 shows how four scenarios were named and described by managers of a protected area with floodplain forest in Tajikistan. Another option is to write short, narrative descriptions of each of the scenarios. You are now ready to integrate this information with the conventional threat information into one or more situation models.

FIGURE 13. ECOLOGICAL DRAWING OF POTENTIAL IMPACTS OF THE "TINDERBOX" SCENARIO

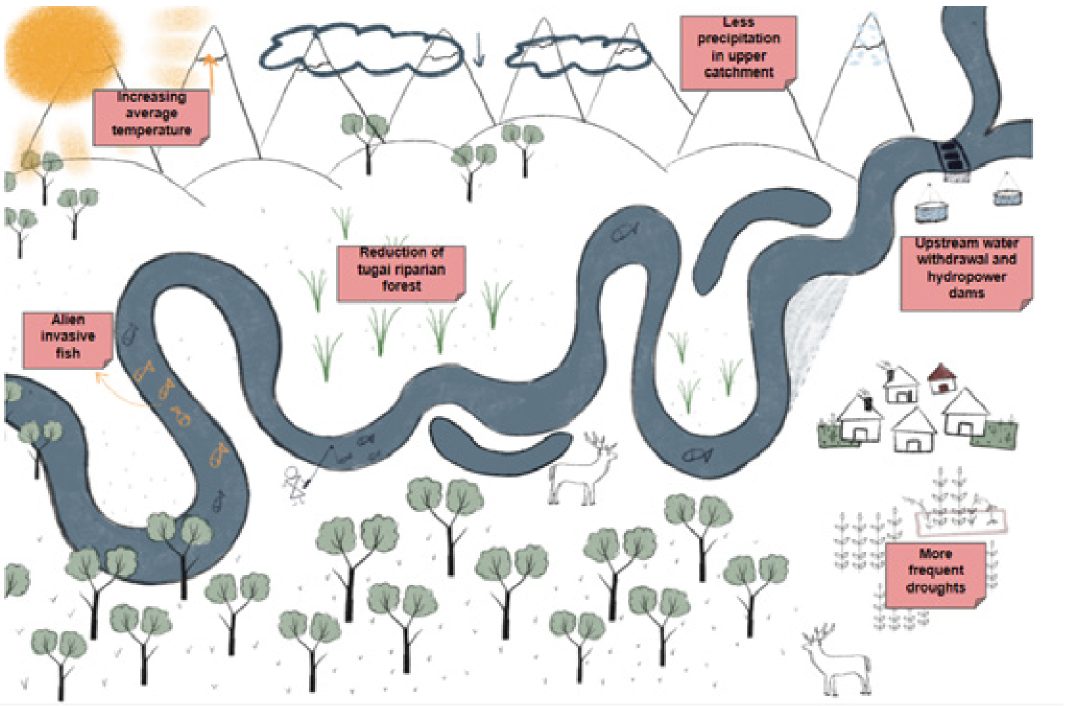
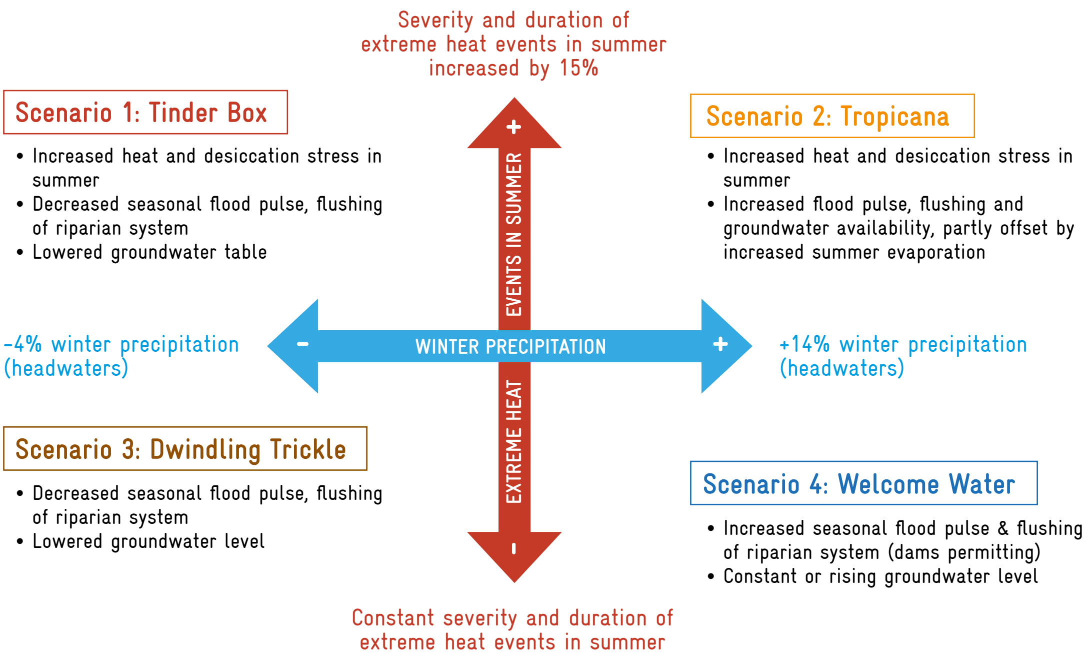


FIGURE 14. POTENTIAL ECOLOGICAL AND SOCIOECONOMIC IMPACTS OF THE "TINDERBOX" SCENARIO

Climate Threats	Impacts on Ecosystems	Impacts on People	Human Reactions
Less precipitation in upper catchment	Streams dry up in summer	Crops drier	More competition over water
Increasing average temperature	Drop in groundwater table Evaporation less infiltration	Less water available for hydropower, Less electricity generated	Increase in withdrawal of water from streams for irrigation Adjustments to operation of hydropower dams?
More frequent & severe floods & droughts	Direct die-offs of tugai forest from heat & desiccation stress	Lower carrying capacity of forest for grazing	Greater competition and conflict over limited grazing land (forest in reserve), pressure to allow more grazing?

FIGURE 15. PROJECTED IMPACTS OF FOUR CLIMATE SCENARIOS IN A PROTECTED AREA WITH FLOODPLAIN FOREST IN TAJIKISTAN

In all scenarios:
- Warmer throughout year (1-2 C°)
- Spring slightly earlier



7. Decide Which Climate Scenarios to Focus On

Even if you decided to examine the potential impacts of all four scenarios in the quadrants, 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, to avoid maladaptation. However, planning for four different scenarios can be cumbersome, and it may be sufficient to focus on only two different scenarios. Focus on the differences between the scenarios and the implications for what actions will make sense.

Work with your planning team to select climate scenarios that represent consequential change (good and/or bad) for your conservation targets. 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 15, the team decided that one scenario ("Tinder Box") was the "worst-case" scenario, and they wanted to explore responses to this possible scenario. They also chose to consider the "Dwindling Trickle" and "Tropicana" scenarios, because they would have significant implications on the viability of the tugai riparian forest. However, they felt that it was not worth discussing the "Welcome Water" 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.

8. Incorporate Projected Climate Impacts into One or More Situation Model(s)

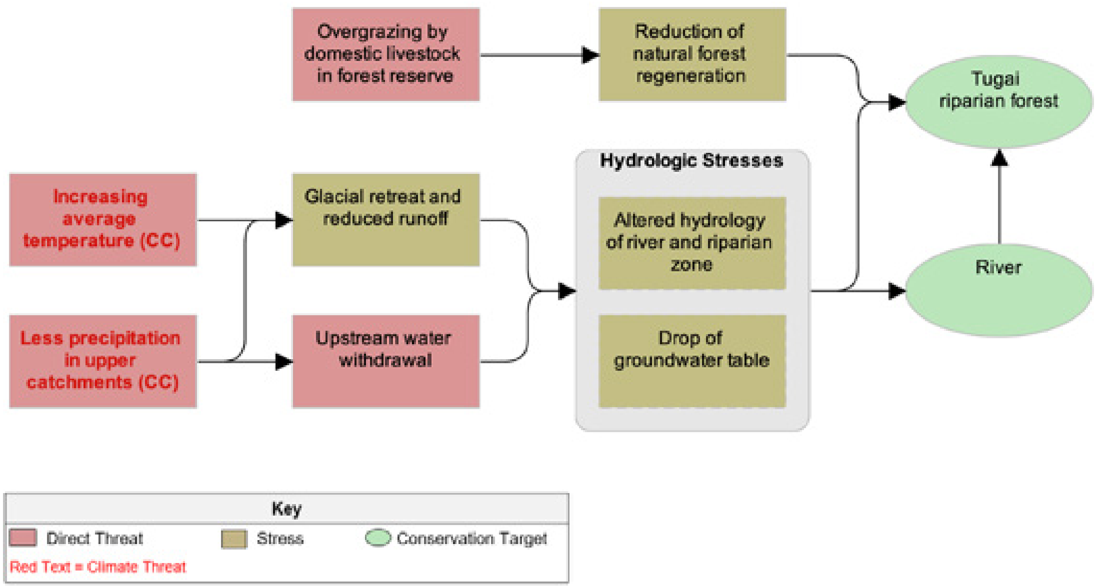
This step involves linking the projected impacts of climate change described in one or more of the different climate scenarios to the conservation targets, human wellbeing targets, and conventional threats in the project situation model. To do this, define climate threats that summarize the projected changes (see Box 7 above for definitions). Below, Box 9 shows examples of the different ways that climate threats can interact with conservation targets and conventional threats in a situation model. Note that depending on how different and complicated your scenarios are, you may need to create multiple situation diagrams - one diagram for each scenario. Or it may be possible to cleverly combine more than one scenario into one situation diagram.

9. (Optional) Include Stresses in the Situation Model

When adding climate threats, we recommend including stresses (Box 9), to describe the biophysical impact of the threat on the conservation target(s). Including stresses can help tell a story about what is happening at a site and how climate change may be exacerbating existing problems. As shown in Figure 16, farmers are withdrawing water from the river for irrigation, which alters the hydrology of the river and riparian zone. A decrease in precipitation, due to climate change, will cause the farmers to withdraw more water for irrigation, exacerbating this conventional threat. At the same time, 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 lower the river that flows into the reserve, which will reduce water availability during dry periods and exacerbate the problem of insufficient water provision to the tugai riparian forest, which will decrease the forest's resilience to conventional threats such as overgrazing by domestic livestock. Showing these linkages can help the project team recognize that addressing conventional threats such as water withdrawal is even more important – and more challenging – after taking climate change into account.

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:

FIGURE 16. EXAMPLES OF INTERACTION BETWEEN CONVENTIONAL AND CLIMATE STRESSES

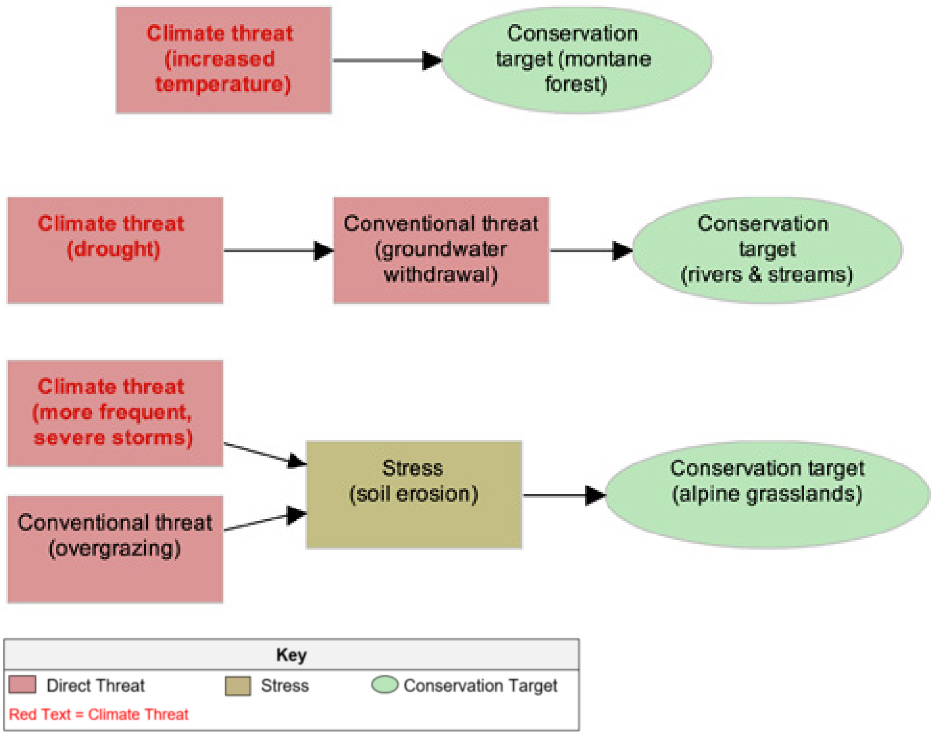


HOW TO REPRESENT CLIMATE THREATS IN A SITUATION MODEL

BOX 9.

There are several different ways to include climate threats in a situation model. First, a climate threat can affect a conservation 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., decreased precipitation causes farmers to pump more groundwater to irrigate their crops). Third, a climate threat and a conventional threat may both affect the same stress (e.g., overgrazing and more frequent, severe storms both contribute to soil erosion in alpine grasslands).

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



- We recommend treating the immediate effects of a higher atmospheric concentration of greenhouse gases (what climate experts call "exposure" factors, see Box 10) as the climate threat. In the example below in Figure 17, "increasing average temperature" and "less precipitation in upper catchments" are both exposure factors and could be treated as climate threats.
- 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 sturgeon), then select the exposure factor that is furthest "downstream" or closest to the conservation target (e.g., "increase in water temperature").
- No "double counting"! Be careful not to define more than one climate threat in the same chain (e.g., increased temperature and more evaporation). If you choose to rate your climate threats, you want to make sure that you aren't rating the same impacts twice.
- Do what makes the most sense and don't get stuck!

The situation model is intended to help your team

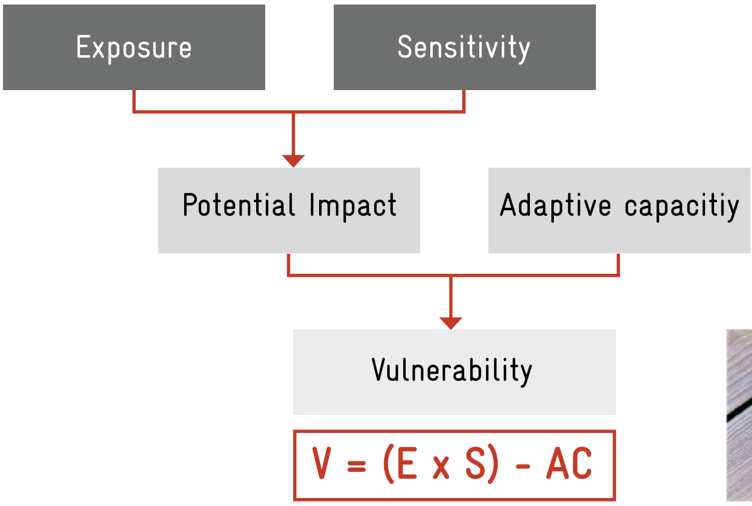
WHAT IS VULNERABILITY TO CLIMATE CHANGE?

BOX 10.

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 strategies.



Adapted from Glick et al. 2011

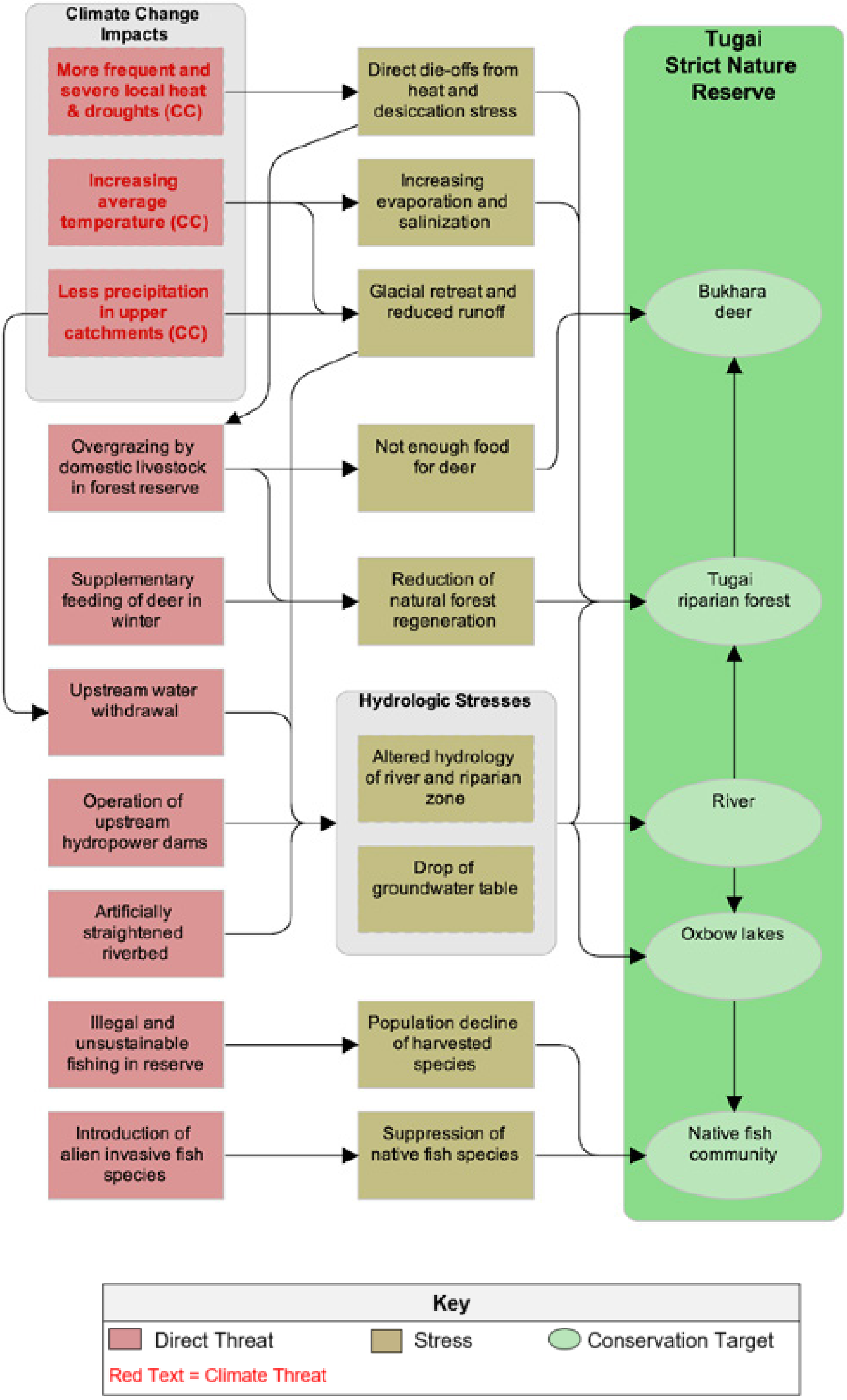
develop a shared mental model of your site -- what conservation targets you are working to conserve, the conventional threats to these ecosystems, and the climate threats that will probably affect them in the future (and may already be affecting them). Find the level of detail that helps you to portray the situation and will allow you to define strategies (for both conservation and climate adaptation) in later steps. In addition to the Central Asia example shown in Figure 17, we have included a second example situation model in Annex 4.

Example Situation Model, Showing Targets, Threats, and Stresses

In the example shown in Figure 17, the team defined three climate threats: more frequent and severe local heat and drought, increasing average temperature, and less precipitation in upper catchments. It is worth noting that some of these climate threats are projected to occur under all scenarios (e.g., increasing average temperature), while others will be more severe under some scenarios than others (e.g., the severity and duration of extreme heat events is higher under two of the scenarios than the two others).

In our example, the team was able to include the projected impacts of different scenarios in the same situation model. While this is ideal (to keep things simple and to produce one consistent set of adaptation strategies, 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 in a mountainous region, while another scenario includes drought and desertification due to decreased precipitation, the project team may need to show these projected changes in different models.

FIGURE 17. EXAMPLE OF CONVENTIONAL THREATS AND CLIMATE CHANGE IMPACTS ON THE TUGAI STRICT NATURE RESERVE



Step 1F. Prioritize Threats

Rate the Threats

Once you have identified both the conventional and climate threats and the interactions between them, you need to prioritize the critical (conventional and climate) threats affecting your conservation targets. The threat rating helps you prioritize where, with limited resources, adaptation strategies 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 species and their capacity to sustain livelihoods.

How to Rate Conventional Threats and Climate Threats

Please refer to both Step 1D "Identify Threats" and Step 1E "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 rating criteria included in Tables 6 and 7.

Note: 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 and target, and the overall rating for 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 that we suggest below. 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 (Table 8) 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 strategies (e.g., invasive species that must be addressed now, because it will not be possible to control them if they get well established).

TABLE 6. 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, scope is measured as the proportion of the target's occurrence. For species, scope is 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, severity is typically measured as the degree of destruction or degradation of the target within the scope. For species, severity is 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 7. CRITERIA FOR RATING CLIMATE THREATS

Step 1F.

Criteria	Definitions
Scope	same as conventional threats (see table 6)
Severity	same as conventional threats (see table 6)
Management Challenge - The challenge that conservation targets face in adapting to the effects of a climate threat.	**Low** - It is likely that there are adaptation strategies that could help the conservation targets 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** adressing them would be feasible with a moderate commitment of resources.
	High - There is some possibility for the conservation targets to adapt to the effects of the climate threat (near-term or long-term) **BUT** adaptation strategies 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 strategies that could help conservation targets to adapt to the climate threat within the scope and time frame (near-term or long-term) **OR** adaptation strategies 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.

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Example Threat Rating

The threat rating results for the Tugai Strict Nature Reserve clarify which threats are likely to have the greatest impact on the conservation targets (and, indirectly, on human communities that depend on them) over the next ten years and beyond. The threat rating table in Table 8 shows ratings for each threat-target combination, as well as summary ratings for each threat (in the column on the right) and summary ratings for each target (in the bottom row).

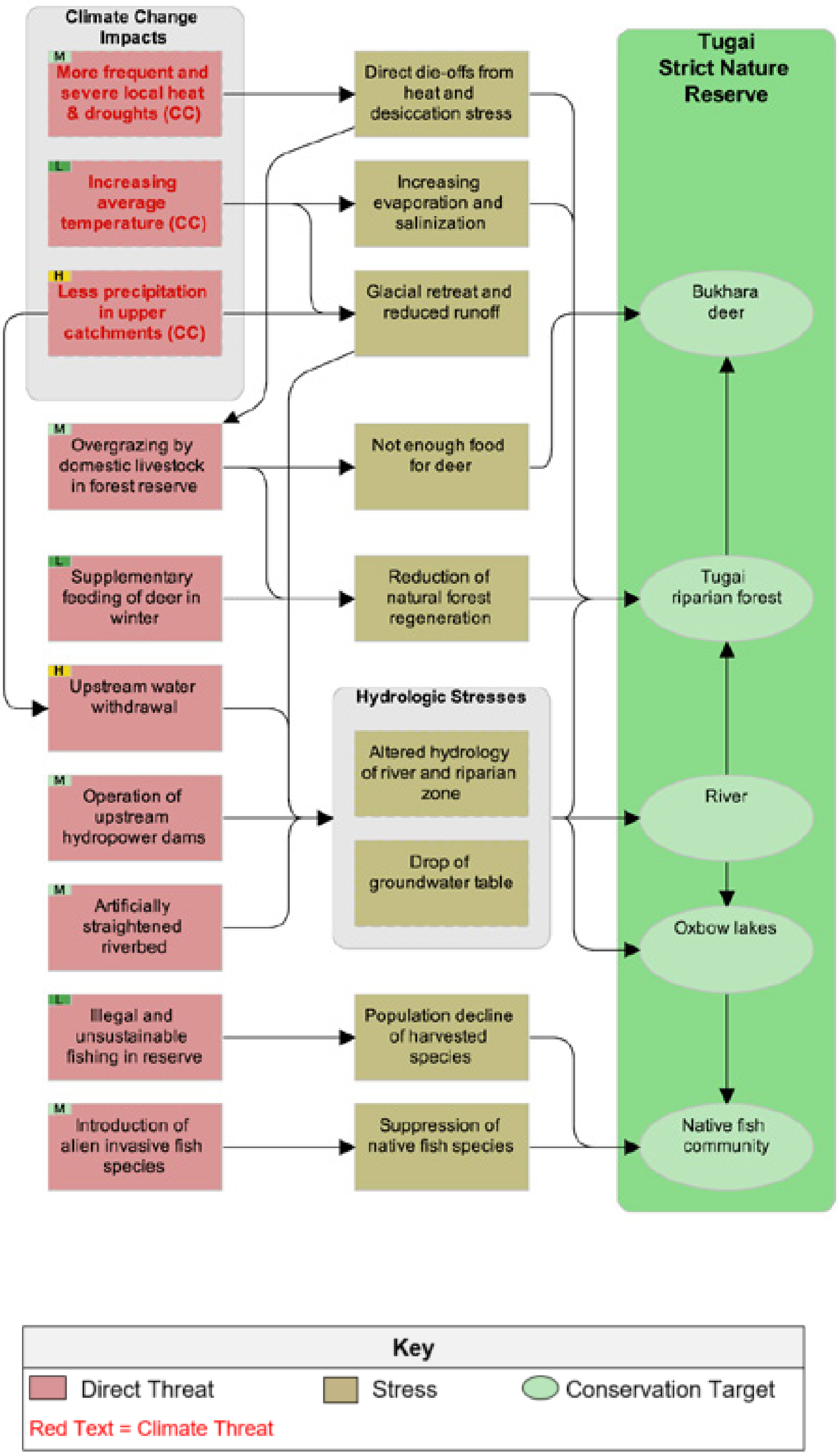
TABLE 8. EXAMPLE RATING OF CONVENTIONAL AND CLIMATE THREATS TO ECOSYSTEMS

Threats \ Targets	Tugai forest	Oxbow lakes	River	Native fish community	Bukhara deer	Summary Threat Rating
Climate threats						
Less precipitation in upper catchments (CC)	High	High	Low	High	Medium	High
More frequent and severe local heat & droughts (CC)	High				Medium	Medium
Increasing average temperature (CC)	Low	Low	Low	Medium	Low	Low
Conventional threats						
Upstream water withdrawal	High	High	Low	Medium	High	High
Artificially straightened riverbed	Medium	Medium	High	Medium	Medium	Medium
Introduction of alien invasive fish species				High		Medium
Operation of upstream hydro-power dams	Medium	Low	Medium	Medium	Low	Medium
Overgrazing by domestic live-stock in forest reserve	Medium				Medium	Medium
Supplementary feeding of deer in winter	Medium				Low	Low
Illegal and unsustainable fishing in reserve				Low		Low
Summary target rating	**High**	**High**	**Medium**	**High**	**Medium**	**High**

Figure 18 shows the linkages between conventional and climate threats and includes the threat ratings in the upper left corner of each threat box. Upstream water withdrawal is the highest conventional threat (rated high), and it is likely to get worse due to decreasing precipitation in upper catchment areas. Overgrazing by domestic livestock is a medium threat and leads to a reduction in natural forest regeneration. Unfortunately, it is also likely to increase as extreme heat events and drought cause desiccation of parts of the tugai forest, decreasing its carrying capacity for grazing.

FIGURE 18. CONVENTIONAL AND CLIMATE THREATS SHOWING THREAT RATINGS FOR TUGAI STRICT NATURE RESERVE IN CENTRAL ASIA

Step 1F.



Step 1G. Complete Situation Analysis

Complete Your Situation Model

Before you begin to think about climate-smart strategies to address threats (conventional or climate related) or restore targets, 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 ecosystems, species, and human wellbeing targets you want to conserve. By understanding the biological and human context, you will have a better chance of developing appropriate goals and designing strategies 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.

Often project teams think they have a shared understanding of their project's context and the main threats and opportunities. However, as they follow a formal process of finding information and documenting their assumptions, they may find that team members have different perceptions of the same situation. In previous steps, you have developed many components of a situation model (Box 11), including your conservation targets, human wellbeing targets, conventional threats, and climate threats. Now, you 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. [18]

18 The guidance provided in this chapter draws heavily from Planning for Conservation: A Conservation Standards How-to Guide (FOS 2020). For more detailed guidance, please see the chapter on Developing a Situation Analysis and Model. https://spark.adobe.com/page/6XaDPKyVSjTfU/

How to Complete a Situation Analysis and Situation Model

Contributing factors include the economic, political, institutional, social, and/or cultural influences that drive, or shape, 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 or capitalized upon to deter threats, or places where opportunities could easily be created. Examples of opportunities include existing strong legislation, markets for certified products, a high level of awareness of conservation issues, and cultural values that support climate-smart conservation.

We do not recommend defining contributing factors for your climate threats, because these factors are almost always outside of the scope of what a climate-smart conservation project addresses. The factors contributing to climate threats are increased atmospheric concentrations of GHG emissions and the factors contributing to that include all of the sources of those GHG emissions. While reducing GHG emissions is essential for planetary health, it is typically outside of the manageable interest of local climate-smart conservation projects.

Focusing on each of the conventional threats to your conservation targets, work from right to left to identify each of the contributing factors and add it into your model. Questions to consider for this step include:

BOX 11.

COMPONENTS OF A SITUATION MODEL

A situation model is a visual diagram summarizing your understanding of the project's context – including describing the relationships among the biological environment and the social, economic, political, and institutional systems and associated stakeholders that affect the conservation targets you want to conserve. It should contain the following elements:

Conservation target: An element of biodiversity (species, habitat, or ecological system) at a project site on which a project has chosen to focus.

Conventional threat: A human action that directly degrades one or more conservation targets (e.g., logging, urban development). They are typically tied to one or more stakeholders.

Human wellbeing target: A component of human wellbeing affected by the status of conservation targets. All human wellbeing targets at a site collectively represent the array of human wellbeing needs dependent on the conservation targets.

Climate threat: Observed and expected changes in climate that degrade one or more conservation targets, or exacerbate existing conventional threats.

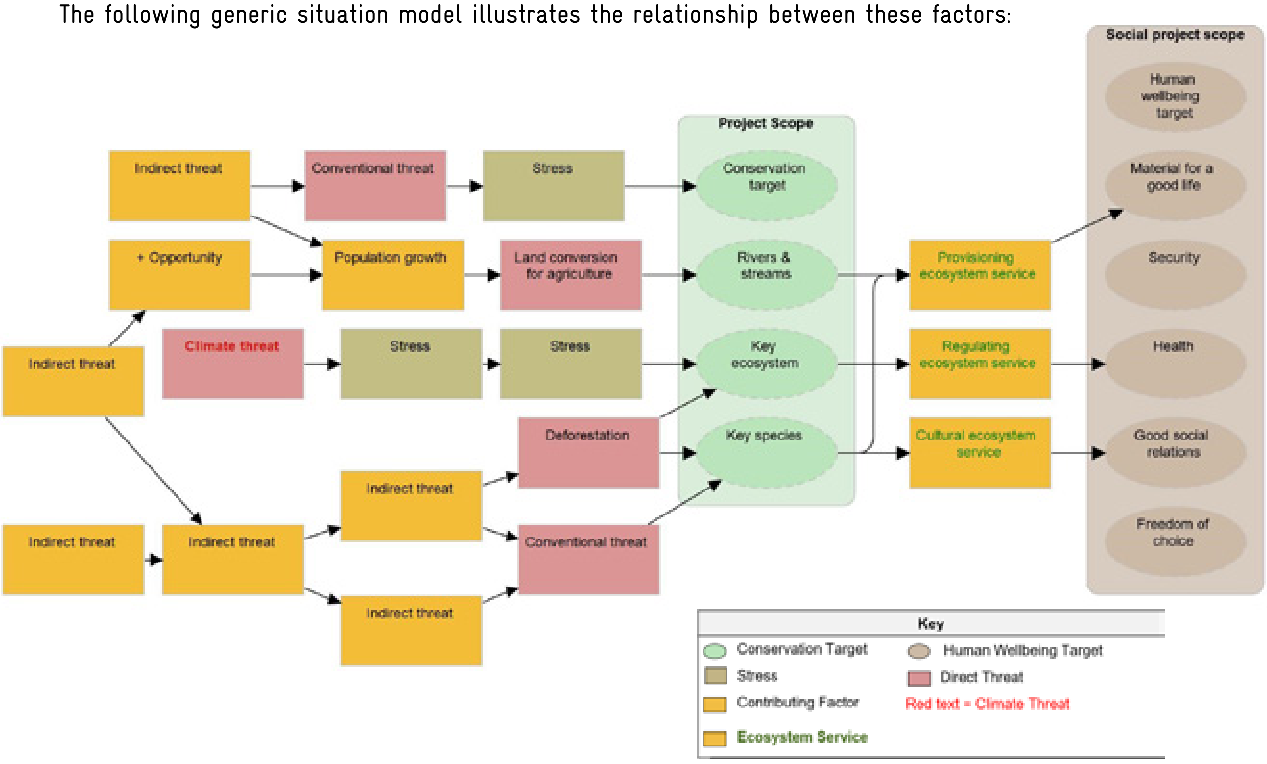
Contributing factor: An indirect threat, opportunity, or other important variable that positively or negatively influences conventional threats.

> Indirect threat: A factor identified in a situation analysis that is a driver of a conventional threat, and is often an entry point for conservation actions (e.g., logging policies, human population growth).
> Opportunity: A contributing factor that could have a positive effect on a conservation 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 (place-based, target-based or thematic-based) of a project.

Stress (optional): Attributes of a conservation target's ecology that are impaired directly or indirectly by human activities or climate threats (e.g., forest degradation or reduced forest area).

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



- Who is undertaking what activities that contribute to this conventional threat?
- What are their motivations? Are their actions driven by economic dependency (livelihoods) or economic advantage? Are these resources replaceable by other resources? Who has legal jurisdiction over the use of the resource and who regulates its use for conservation, economic development, or other purposes?
- What incentives and disincentives influence this threat? What economic, political, institutional, social, or cultural factors contribute to this threat?
- What is the feasibility of decreasing this threat? Are there positive factors (opportunities) that currently contribute or potentially could contribute to decreasing this threat?

In our example, the team analyzed the factors contributing to the conventional threat of illegal overgrazing inside the reserve's tugai forest. As shown in Figure 19, they decided that the most important factors include strong demand for grazing land and this is driven by demand for cheap meat and milk products. The pastures in the arid lands outside the reserve are not sufficient to feed all of the community's livestock. Local people have traditionally grazed their cattle in the reserve. In addition, the protected area administration tolerates grazing inside the reserve, because it does not have the means to prevent it. Because some reserve staff benefit from existing informal grazing arrangements, there is a strong disincentive to remove cattle from the reserve. This arrangement weakens the rule of law.

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, although critical factors should not be excluded just because they are outside your sphere of influence.

Do not forget to consider opportunities (e.g., favorable policy environment, community interest in conservation). There are almost always some opportunities. Be sure to phrase the opportunity as a neutral factor (e.g., increasing demand for sustainably produced meat) and not a strategy (e.g., promote certified holistic grazing practices). In a later step, when we discuss strategies, you can decide if you want to develop strategies that would take advantage of these opportunities.

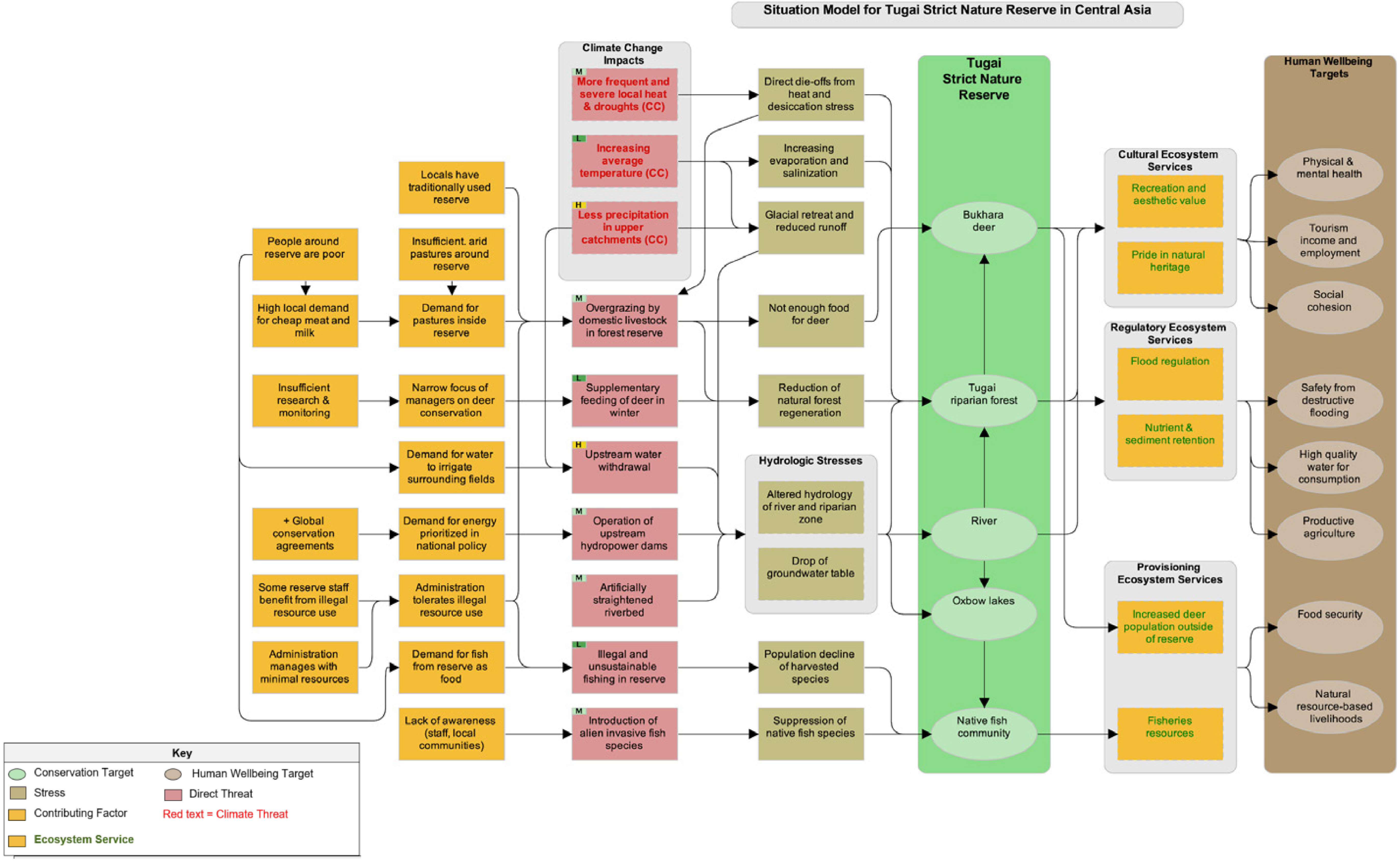
Draw arrows to show the relationship that each factor has with other factors. These arrows will help you later to identify critical factors and potential paths along which you could establish your project goals and objectives. If there are uncertainties, you can note them using question marks and try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

Example of a Complete Situation Model

Below is an example of a complete situation model for the Tugai Strict Nature Reserve in Central Asia. The reserve includes the forest itself, a local endemic deer species, oxbow lakes, the surrounding wetlands, native fish, and the river that feeds the entire system. These ecosystems and species face both conventional and climate threats and there are interactions between these threats. For example, the forest, oxbow lakes, and wetlands are threatened by the combined hydrologic effects of upstream water withdrawal, the operation of dams, and the straightening of the river bed. All of these threats will be aggravated by climate change, which will bring hotter and likely drier conditions to the area, and reduced water in the river because of reduced upstream precipitation. There is also overgrazing by both livestock and deer inside the forest and it is likely that drier conditions will increase the impact of overgrazing.

A good situation model should include the full range of relevant contributing factors (e.g., policy, governance, socio-economic, institutional, and cultural factors) and tell a story about the context of the project. In our Central Asian project, for example, the operation of the hydropower dam is influenced by demand for energy and national policies prioritizing energy production. Yet, global conservation agreements may provide an opportunity to ensure that the river receives at least the ecologically necessary amount of water (to ensure "ecological flow") during dry periods. Illegal and unsustainable fishing occurs due to local demand for food and the reserve administration's tolerance of illegal resource use. The administration tolerates this because they have few resources for management and some reserve staff benefit from the illegal fishing. Supplementary feeding of the deer in the winter contributes to overgrazing that reduces natural regeneration of the tugai forest. This occurs because the reserve managers focus narrowly on deer conservation, rather than broader conservation of the ecosystem, and do not conduct sufficient research and monitoring to understand the impact of the supplemental feeding.

FIGURE 19. COMPLETE SITUATION MODEL FOR THE TUGAI STRICT NATURE RESERVE



Step 2A. Re-evaluate Your Scope and Targets and Set Goals

Re-evaluate Scope and Targets

As conservation practitioners, we are accustomed to looking to the past to imagine the ideal status of our conservation targets, when they faced less threats. When thinking about our goals, we often wish that we could restore our forests to their historic (19th century, perhaps) area and condition or bring back the fisheries documented in the 1920s. Under a rapidly changing climate, however, it is problematic to use past conditions as the benchmark for setting conservation goals. Instead, conservation goals need to focus on future climatic and ecological conditions.

Before establishing specific, measurable, forward-looking goals, use the information you've gathered in the previous steps to consider, broadly, the feasibility of conserving or restoring your targets. Having completed all of the previous steps, your team now has a much better understanding of the conventional and climate threats to the conservation targets. Take a step back and evaluate whether conservation of these ecosystems and species is realistic, given the combined effects of conventional and projected climate threats.

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

1. Conservation targets – you may need to revise your conservation targets or, in some cases, even consider removing one, if the likelihood of conserving this target is low. This could be because its viability is already very compromised or it may become too compromised to warrant a positive conservation outlook.
2. Scope – evaluate the need for changes in the project's scope. If climate change is likely to lead to shifts in the latitudinal or altitudinal boundaries of ecosystems, for instance, you may want to extend the geographic scope of the project to allow for such shifts. Conversely, some parts of your scope may be likely to become too stressed by the combined effects of climate change and conventional threats in the future. Your team may decide to exclude these areas from your scope and concentrate your efforts where you are more likely to achieve your desired results.
3. KEAs and indicators – look to add KEAs and indicators related to climate vulnerability as early-warning indicators. Adjust the rating thresholds for KEA indicators so that they correctly reflect the overall viability of your targets.

Perhaps no changes will be necessary, but this is a good time 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 1C to set goals for your conservation targets.

TABLE 9. EXAMPLE GOAL SETTING BASED ON VIABILITY ASSESSMENT FOR TUGAI RIPARIAN FOREST

			Indicator ratings			
Category	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very good**
Size	Area of tugai forest	% of the area within 500 meters of the river that is forested	< 25%	25-50%	51-75%	> 75%
Current status of indicator				40%		
Desired future status of indicator					60%	
Condition	Rejuvenation of *Populus pruinosa*, the dominant species	Density of 3-yr saplings per m^2	< 0.1	0.1-1	1-5	>5
Current status of indicator			0.05			
Desired future status of indicator					1.5	
Condition	Soil salinity	Electrical conductivity of soil solution (mS/m)	> 400	201-400	50-200	< 50
Current status of indicator			450			
Desired future status of indicator					150	
Landscape context	Intensity of seasonal flooding	# of days per year with submerged forest surface (standard sample sites)	< 10	10-25	25-50	> 50
Current status of indicator				16		
Desired future status of indicator						51 or more

How to Re-evaluate Scope and Targets and Set Goals

1. Re-evaluate Your Scope and Targets

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

- Will the conservation targets still be viable within your geographic scope in 50 years, assuming the best possible conservation efforts?
- If some of your conservation targets will not be viable within your scope in 50 years, is it important to provide them temporal refuge in the short term (e.g., islands in the sea that will eventually be underwater due to sea level rise but that over the next few decades will continue to support breeding populations of seabirds that later could colonize higher areas that are now poorly protected)?
- Will it be possible to conserve the original ecosystems or should you be facilitating a shift to a different composition of ecosystems and species?

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

KEY TERMINOLOGY

GOAL – A formal statement detailing the desired impact of a project, such as the desired future status of a target

The high-mountainous regions of Central Asia with their species-rich alpine flora represent a hypothetical example of this. In this region it is highly likely that vegetation belts will move up the mountains as temperatures rise. The alpine grassland belt might disappear altogether in montane areas with relatively low peaks, simply because there may be nowhere to move altitudinally in such areas. Under these conditions, conservation planners might re-evaluate their efforts and decide to focus on conserving other vegetation (i.e., other ecosystem targets) typical of lower altitudes and work to conserve alpine vegetation only where it has room to adapt to climate change by moving uphill.

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 conservation target. 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 conservation 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 measures of those indicators. This may not be an easy step. It is okay to draft goals that you can improve iteratively over time.

To define quantitative or qualitative goals for each of your conservation targets, begin by defining the desired measure for each of the indicators for the KEAs defined in the viability assessment (Table 9). The basic question is: what level of the KEAs will allow the conservation 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 its best judgment. Do not be surprised if, during the course of discussion, your team decides to change KEAs or even conservation targets.

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

For each conservation target, determine a desired future rating, i.e., the level of each KEA that is ambitious but possible over the long term. The time frame is not important.

Also for each conservation target, you may want to develop one or more goal statements that incorporate the desired future measures of the indicators with a timeframe for the goal (usually 10 years or more). In our tugai forest 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.

Step 2B. Select Climate-Smart Strategies

Identify and Select Climate-Smart Strategies

Once the team has established an understanding of the situation, including likely climate scenarios and their implications for biodiversity and possible human responses, it is time to move on to selecting **strategies**. The majority of strategies in conservation projects focus on abating existing conventional threats or enhancing the viability of conservation targets and with that their resilience to climate change. Also relevant in light of climate change are strategies that are focused on adaptation measures to either artificially create conditions for biodiversity or to prevent likely human maladaptation resulting from climate impacts.

We distinguish between different types of climate-smart strategies (see below). These strategy types are intended to stimulate thinking about the different options for taking action. Please do not feel obliged to develop strategies for all types.

(Conventional) Threat Abatement:

1a. Strategies to reduce vulnerability to climate-related stresses by reducing conventional threats

1b. Strategies to protect **climate refugia** from conventional threats

Viability Enhancement:

2. Strategies to enhance viability to increase the resilience of a target (i.e., restoration)

Adaptation:

3a. Creating artificial habitats or conditions for biodiversity

3b. Preventing human **maladaptation** – assisting humans to adapt so that they won't make problems worse

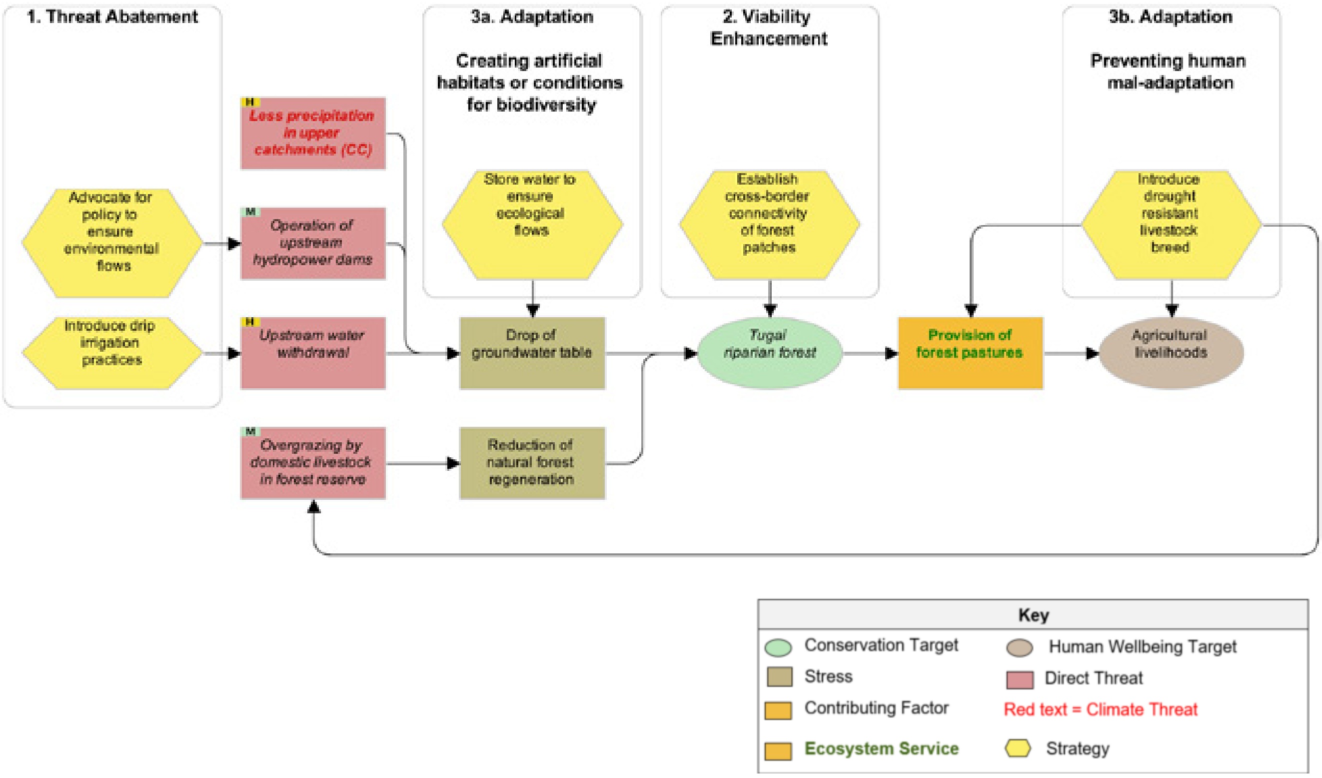
1a. Strategies to Reduce Vulnerability to Climate-Related Stresses by Reducing a Conventional Threat

This type of strategy decreases vulnerability to climate-related stresses by reducing a conventional threat that exacerbates climate impacts or directly decreases the viability of a conservation target. In our example the tugai riparian forest (Figure 20) is threatened by reduced precipitation in upstream areas (a climate threat), as well as upstream water withdrawal and hydropower dams (both conventional threats) that decrease the groundwater table. Introducing drip irrigation practices upstream should reduce the upstream water withdrawal. Advocating for a policy to ensure environmental flows from hydropower dams should help increase groundwater levels (addressing the conventional

KEY TERMINOLOGY

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

FIGURE 20. EXAMPLES OF CLIMATE-SMART STRATEGIES IN THE TUGAI STRICT NATURE RESERVE



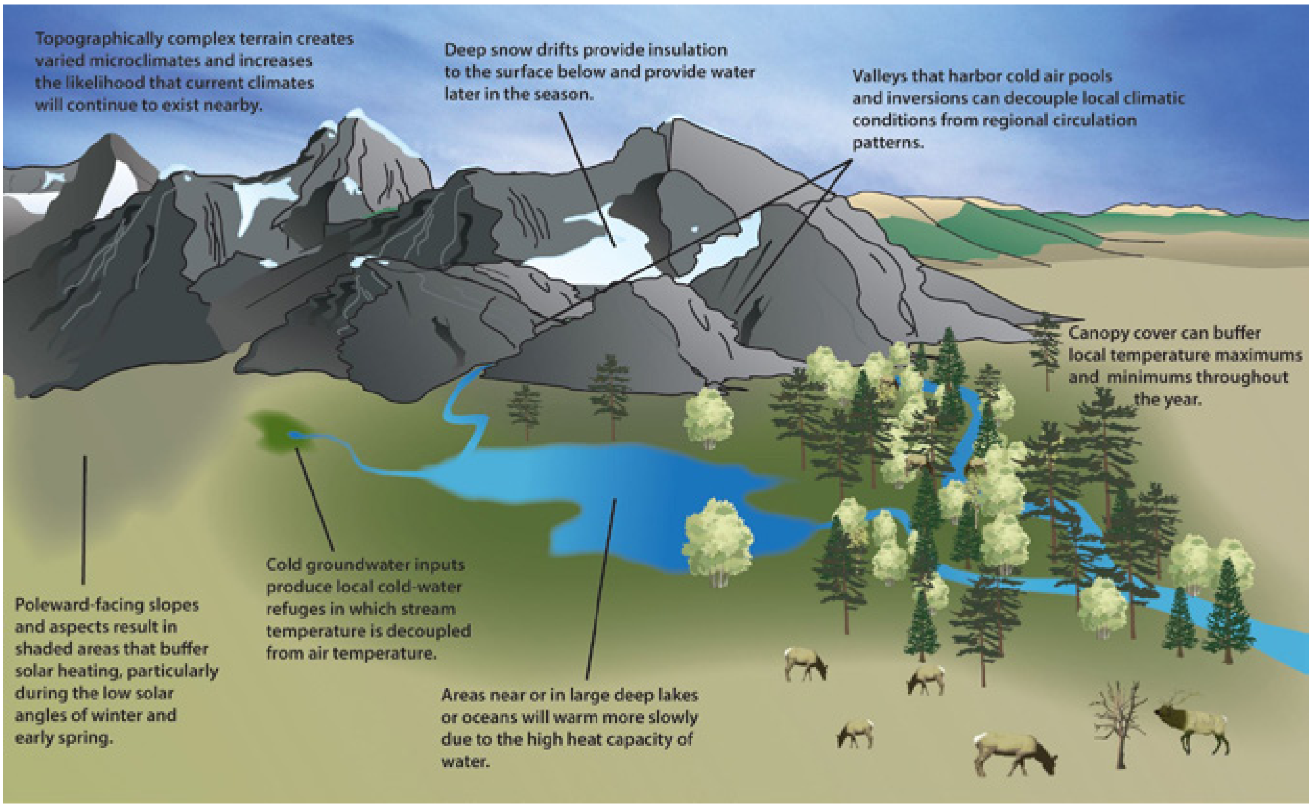
threat of inappropriate dam management). As is usually the case, in this example it is not possible to tackle the climate threat (reduced precipitation in upstream areas). However, it is possible to act on the conventional threats and with that decrease the magnitude of the stress of decreasing the groundwater table, thus indirectly enhancing the resilience of the conservation target.

1b. Strategies to Protect Climate Refugia (Occurrences of the Target Not Exposed to Climate Change)

A special type of strategy is focused on protecting climate refugia (i.e., occurrences of targets that are not exposed to climate change) from conventional threats to allow components of biodiversity to persist or potentially expand under changing environmental conditions. Identification and prioritization of climate refugia can inform the selection of conventional threat abatement strategies and their spatial focus. An example of this is to protect microhabitats that are shaded as a consequence of their position in a mountain range. This could help buffer climate change induced increases in water temperature.

> **KEY TERMINOLOGY**
>
> CLIMATE REFUGIA – "Habitats that components of biodiversity retreat to, persist in and can potentially expand from under changing environmental conditions" (Keppel et al., 2012). Refugia are characterized by their ability to provide long-term (over several generations) mitigation of environmental changes that make surrounding areas unsuitable.

FIGURE 21: . EXAMPLES OF POTENTIAL CLIMATE REFUGIA



Morelli et al. 2016

2. Strategies to Maintain and Enhance Viability to Increase the Resilience of a Target (e.g., Connectivity)

Viability enhancement strategies directly improve the health of the conservation target. Generally, healthier targets are likely to have greater resilience (more capacity to adapt to changes in climate) than degraded targets. Focusing on improving KEAs (defined in Step 1C) can enhance the resilience of a conservation target. In our example project, the KEAs for the tugai riparian forest include the size of the forest, regeneration of the dominant tree species, species composition, forest connectivity, and the flooding regime. Restoring larger patches of the tugai forest will improve the KEA forest size, while restoring the connectivity between forest patches in two neighbouring countries and restoring the hydrologic regime would increase the chances for the tugai forest to cope with droughts and increase the range for Bukhara deer and other species.

3a. Creating Artificial Habitats or Conditions for Biodiversity

Sometimes, in the face of climate change, it is necessary to artificially support conditions for biodiversity. In our example project, the stress of decreasing groundwater levels could be mitigated by storing water in reservoirs and releasing it into the river when necessary, to maintain ecological flows.
Another example of this type of strategy is translocation of species to help them to persist as climate conditions become less favorable within their historic range and more favorable in other areas. Often such strategies work for a while but can turn out to be less effective in the long run as they are neither tackling the threats to the ecosystem, nor are they enhancing adaptive capacity. That said, they can be important to buy time and figure out alternatives for the ecosystem and people depending on it.

Step 2B.

3b. Preventing Human Maladaptation

Once climate starts affecting people directly, they adapt to the new conditions. People can be especially affected by the degradation of ecosystem services. Unfortunately, the adaptation responses can turn out to be maladaptive and negatively affect ecosystems within the scope (see key terminology box). If it is possible to anticipate maladaptive human responses to climate impacts, it may be possible to implement strategies to prevent them. Such strategies 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, farmers depend on riparian forest grazing areas for their livestock. Already today the overgrazing from livestock threatens the forest ecosystem and Bukhara deer. Over the long term, the decrease in groundwater levels will reduce the productivity of forest grazing areas and intensify the problem. Switching to a different, more drought-resistant breed of livestock could allow farmers to graze their livestock in drier areas outside the forest and decrease the pressure on the remaining forest land, while helping ranchers adapt to drier conditions.

The use of the CS to support communities through ecosystem-based adaptation to climate change – including ways to avoid maladaptation – is discussed in more detail in a sister publication (GIZ & CMP 2020).[19]

KEY TERMINOLOGY

MALADAPTATION – "An adaptation that does not succeed in reducing vulnerability but increases it instead" (McCarthy et al. 2001).

Maladaptation includes actions that, relative to alternatives:
- exacerbate stresses on ecosystems and species
- include taking actions that later prove to be ineffective under new climate conditions
- push the problem downstream (e.g., engineered solutions to flooding that exacerbate stormwater runoff)

19 https://www.adaptationcommunity.net/download/GIZ-CMP_CoSEbA-Guidance.pdf

How to Identify and Select Climate-Smart Strategies

1. Use Your Situation Model to Brainstorm Potential Strategies

Strategies should be linked to specific elements of your situation model. Use your situation model to identify "key intervention points," factors that need to be addressed and are feasible to influence. Consider the different types of strategies described earlier and where it makes most sense to act. Begin your strategy 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 strategies to influence key intervention points. Think outside of the box and consider different approaches to resolving the issue. Use all of the work you have done in previous steps and consider innovative solutions – not just what you have always done. It often helps to put yourself into the shoes of the stakeholder who is eventually going to implement or be affected by the strategies 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 strategies 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 Strategies Are Not Maladaptive Under Specific Climate Scenarios

It is important to evaluate whether each of your potential strategies will be effective under all of the climate scenarios that your team has considered important. If a strategy will be effective under all scenarios, then it can be considered "climate robust." If it is harmful under some scenarios, we consider it potentially "maladaptive." It is also possible for a strategy to be "sometimes effective" – 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" strategy** – A strategy 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" strategy** – A strategy 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" strategy** – A strategy that causes harm to human or ecological systems in one or more scenarios, i.e. that fosters adaptation in the short-term but insidiously affects 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.

3. Compare Possible Strategies and Select Your Final Set of Strategies

Typically you'll end up with a whole suite of possible strategies – more options than you can realistically implement. Rating each potential strategy based on a clearly defined set of criteria can generate interesting discussions and help you to select those strategies that will most effectively and efficiently accomplish your goals. Use objective criteria such as:

- potential impact of the strategy
- technical and social feasibility of implementing the strategy
- feasibility of obtaining the financial resources needed to implement the strategy

Box 12 includes definitions for three criteria commonly used to rate strategies. Add other criteria as needed, such as cultural appropriateness, urgency, or the extent to which this strategy fills a niche that is not filled by others. Compare your strategy ratings and decide on your final set of strategies. Table 10 provides an example of a relative strategy ranking. Each strategy is rated relative to the other strategies for each criterion. In Table 10, because there are 10 potential strategies, the one that has the highest potential impact is given 10 points and the one with the lowest potential impact receives 1 point. After applying all of the criteria, one simply adds up the ratings to get a total score for each potential strategy.

The relative rating is a tool to support decision-making. That said, it still depends on the team to discuss and make a decision. The discussion about the rating is more important than the rating itself and often teams decide to implement a combination of higher and lower ranking strategies. In our example the team chose to implement five of the potential ten strategies (with total scores in bold). Figure 22 shows the situation model with the final strategies.

CRITERIA FOR RATING CLIMATE-SMART STRATEGIES

BOX 12.

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

- *Very High* – The strategy is very likely to completely mitigate a threat, restore a target, or ensure effective adaptation of people's livelihoods.
- *High* – The strategy is likely to help mitigate a threat, restore a target, or ensure effective adaptation of people's livelihoods.
- *Medium* – The strategy could possibly help mitigate a threat, restore a target, or support adaptation of people's livelihoods.
- *Low* – The strategy 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 strategy within likely time, staffing, ethical, and other constraints. This generally depends on the ease of implementation of the strategy, 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 strategy 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 strategy is socially acceptable, but it may require some additional technical expertise or stakeholder involvement for successful implementation.
- *Medium* – The strategy 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 strategy is either not technically feasible or not socially acceptable.

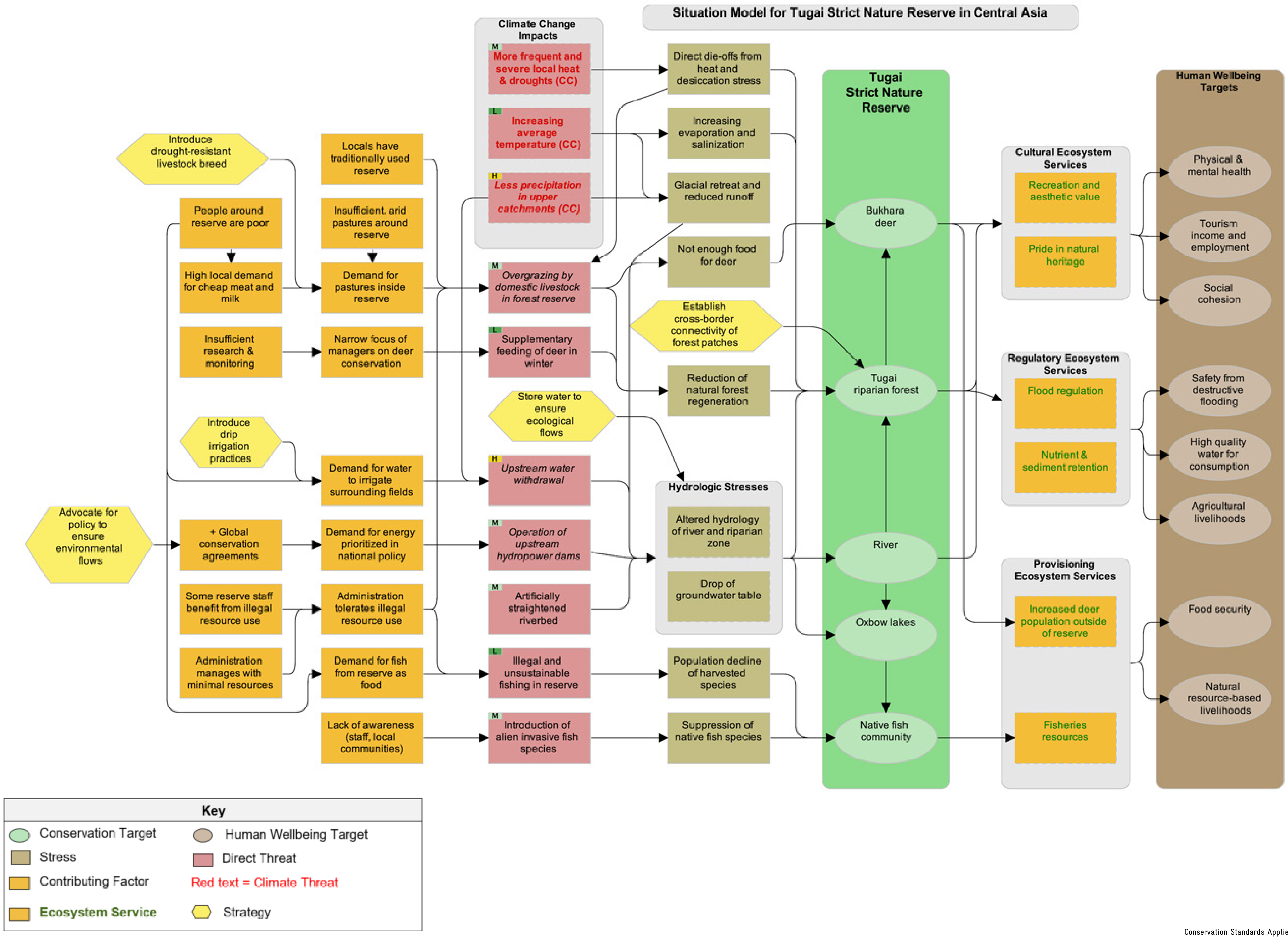
Financial Feasibility – Cost of the strategy and feasibility of obtaining the financial resources necessary to implement it.

- *Very High* – The strategy 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 strategy is financially feasible, but it may require some additional financial resources.
- *Medium* – The strategy is financially difficult to implement without substantial additional resources and/or it is difficult to obtain the necessary financial resources.
- *Low* – The strategy is very expensive and/or it is very difficult to obtain the necessary financial resources.

TABLE 10. EXAMPLE RATING OF POTENTIAL STRATEGIES

Potential Strategies (priority strategies in bold)	Type of Climate-Smart Strategy	Criteria for Ranking Interventions			Total Score (priority strategies in bold)
		Potential Impact	Technical & Social Feasibility	Financial Feasibility	
A. Promote alternative livelihoods (nature based tourism)	1. Threat abatement / 3. Adaptation	1	1	5	7
B. Introduce drought resistant livestock breed	1. Threat abatement / 3. Adaptation	7	6	7	**20**
C. Fencing of forest regeneration areas	1. Threat abatement	4	7	3	14
D. Establish cross-border connectivity of forest patches	2. Viability enhancement	8	2	2	**12**
E. Introduce drip irrigation practices	1. Threat abatement	9	9	4	**22**
F. Improve deer management with reduced winter feeding	1. Threat abatement	2	3	9	14
G. Store water to ensure ecological flows	3. Adaptation	3	5	6	**14**
H. Advocate for policy to ensure environmental flows	1. Threat abatement	10	8	8	**26**
I. Establish sustainable financing mechanism (trust fund)	1. Threat abatement	5	4	1	10
J. Establish artificial fish ponds outside the reserve	1. Threat abatement	6	10	10	26

FIGURE 22. TUGAI STRICT NATURE RESERVE SITUATION MODEL WITH PRIORITY STRATEGIES



Step 2C. Develop Theories of Change and Monitoring Plan

Use Results Chains to Depict Your Theory of Change

Once you have selected your strategies, you should clarify your assumptions about how each strategy 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 results. For climate smart conservation projects, the results chain usually shows how specific strategies will lead to a reduction in conventional threats and increase in the viability and adaptive capacity of conservation targets. The tool also shows the broad 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 strategy 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). 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 strategy is sufficient or additional strategies 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.

KEY TERMINOLOGY

THEORY OF CHANGE: A series of causally linked assumptions about how a team thinks its actions will help it achieve both intermediate results and longer term conservation and human wellbeing goals. A theory of change can be expressed in text, using a diagram, or with other forms of communication.

RESULT: The desired future state of a target or factor. Results include impacts, which are linked to targets, and outcomes, which are linked to threats and opportunities.

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

How to Develop a Results Chain

Step 2C.

1. Select a Priority Strategy

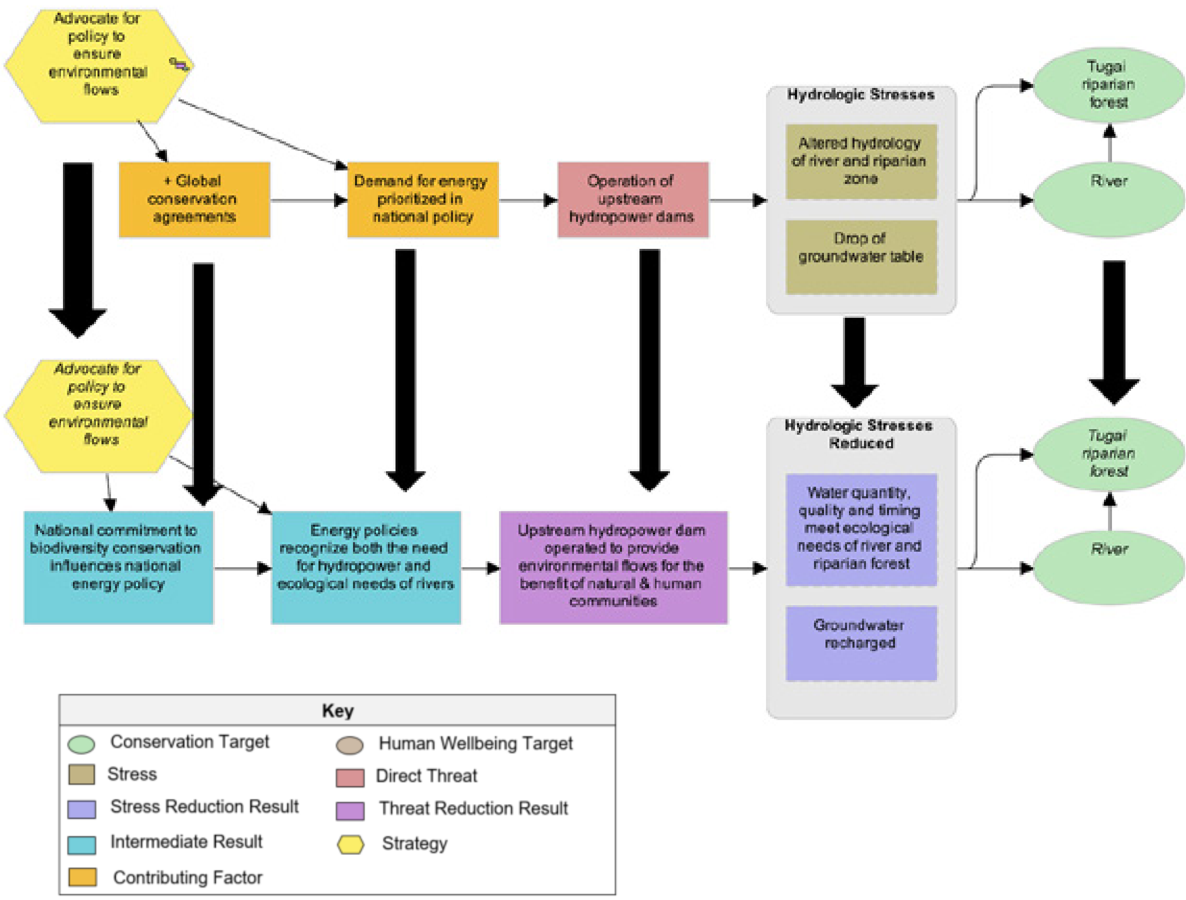
Starting with your simplest strategy, use your situation model to identify all the drivers and conventional threats (and possibly stresses) that the strategy will influence.

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 strategy is in place.

In our example situation model, the team proposed a strategy to advocate for a national policy to require that hydroelectric dams are managed in a way that ensures that the river receives enough water to meet ecological needs (known as "environmental flows"). In our example project, the strategy ("Advocate for policy to ensure environmental flows") links to the opportunity of "global conservation agreements," because the national government is a party to the United Nations Convention on Biological Diversity (CBD) and thus is committed to incorporating biodiversity conservation into national policies in different sectors, including energy. The strategy also links to "demand for energy prioritized in nation-

FIGURE 23. AN EXCERPT OF THE TUGAI RESERVE SITUATION MODEL TURNED INTO AN INITIAL RESULTS CHAIN



THE IF...THEN TEST

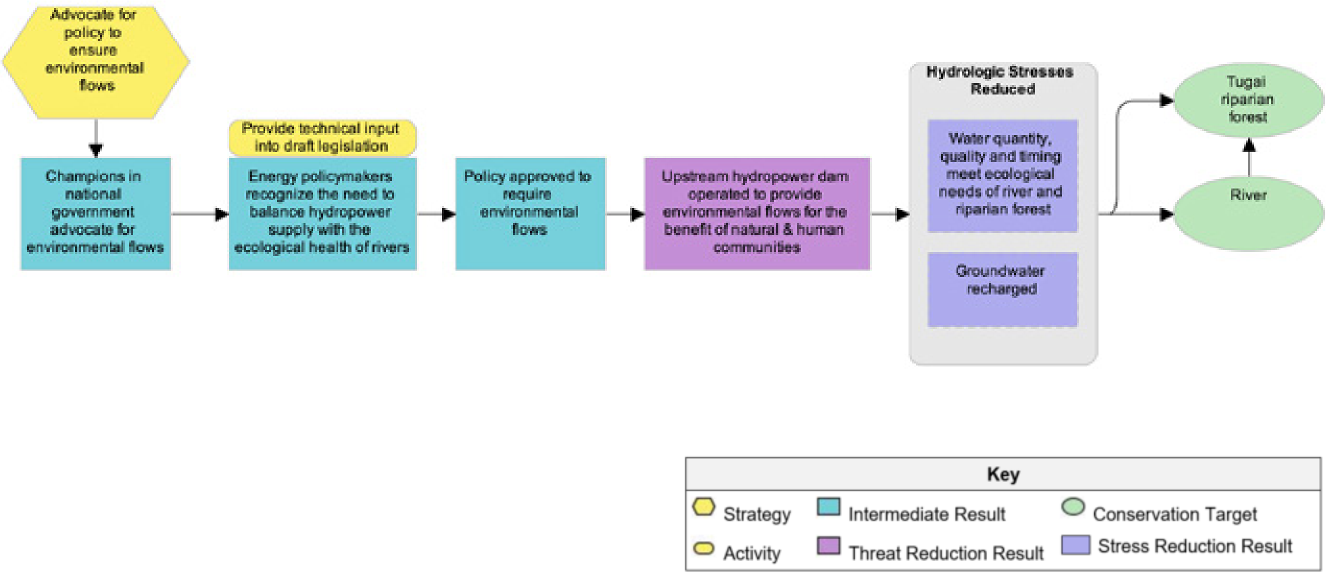
BOX 13.

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.

al policy," because policies that govern hydropower development currently focus on the need for energy production but will need to balance energy production with aquatic biodiversity conservation.

As shown in Figure 23, this step involves taking the chain of factors from the situation model and turning them into an initial chain of desired results. Thus, the project team turned the opportunity (+) of "Global conservation agreements" in the situation model into "National commitment to biodiversity conservation influences national energy policy" in their initial results chain. They turned "Demand for energy prioritized in national policy" into "Energy policies recognize both the need for hydropower and the ecological needs of rivers." They changed the threat of "Operation of upstream hydropower dams" into the threat reduction result of "Upstream hydropower dam operated to provide environmental flows for the benefit of natural & human communities." The team made the stresses of "Altered hydrology of river and riparian zone" and "Drop of groundwater table" into the stress reduction results of "Water quantity, quality and timing meet the ecological needs of the river and riparian forest" and "Groundwater recharged."

FIGURE 24. NEXT DRAFT OF RESULTS CHAIN FOR POLICY TO ENSURE ENVIRONMENTAL FLOWS



3. Add Results and Activities Needed to Complete the Links in the Results Chain

The next step is to add all of the intermediate results necessary to create clear, logical "if…then" linkages 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 strategy, however, we recommend that you work from left to right, asking what the immediate results or outcomes of the strategy 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 strategy 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 ecosystem services, and reduce the threat, what outcomes are needed to make that happen, etc. This will help you refine the focus of your strategy.

Our example project team decided to work initially on the right side of their results chain, because they were working on an innovative strategy. As shown in Figure 24, they chose to add the result "Policy approved to require environmental flows" and considered what was needed to achieve this result. They decided to adjust their initial results, based on their conclusion that if champions in the national government were to advocate for environmental flows, then it could be possible for energy policymakers to recognize the need to balance hydropower production with the ecological health of rivers by passing legislation requiring environmental flows. 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 (Figure 24). Please note that, to make the figures larger and more legible, we have not included ecosystem services and human wellbeing targets in the results chains in this chapter.

After completing this second version of their results chain, the team recognized that there was a need to build awareness of the impact of dams on aquatic biodiversity and how environmental flows could reduce this impact. They also identified a "leap of faith" between the "Policy approved to require environmental flows" and their threat reduction result "Upstream hydropower dam operated to provide environmental flows…". Once the policy was approved, they recognized the need for the local hydropower company to develop a plan to incorporate environmental flows into dam management. They added a result "Plan developed incorporating environmental flows…" and an activity, because they recognized the need for their conservation team to work with the hydroelectric company to develop this plan.

The team also identified the need for a complementary strategy to establish the legal basis for protecting environmental flows. This strategy would involve legal research to understand national laws and regulations governing water use rights and it would draw on experience in other countries, such as South Africa, where environmental flows have legal standing as a beneficial water use on par with

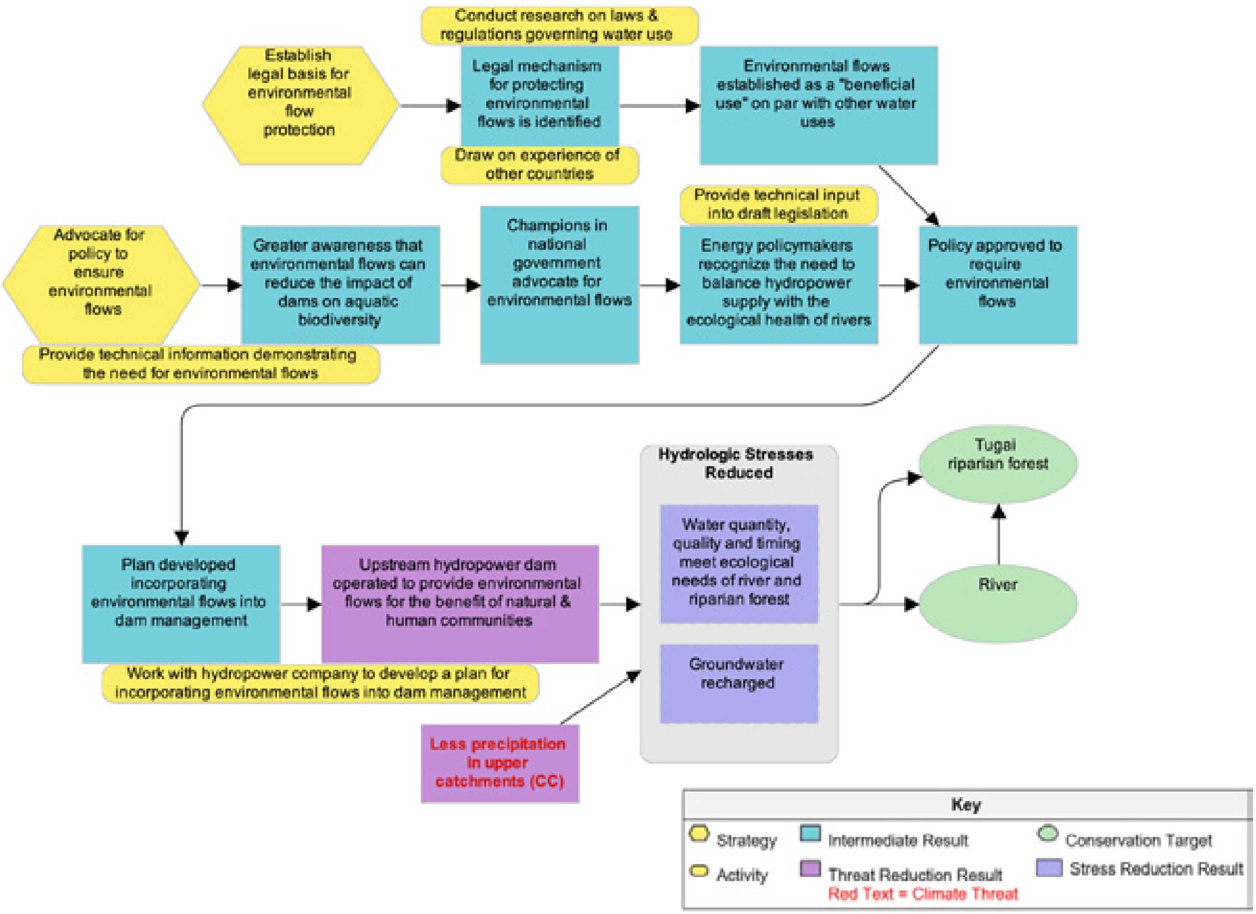
Step 2C.

BOX 14.

CRITERIA FOR A GOOD RESULTS CHAIN

- *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.

FIGURE 25. FINAL RESULTS CHAIN FOR POLICY TO ENSURE ENVIRONMENTAL FLOWS



other water uses. As shown in the team's final results chain (see Figure 25), once a legal mechanism is established and policymakers recognize the need to balance hydropower supply with protecting the health of rivers, then the team believes that policymakers will approve a law requiring environmental flows.

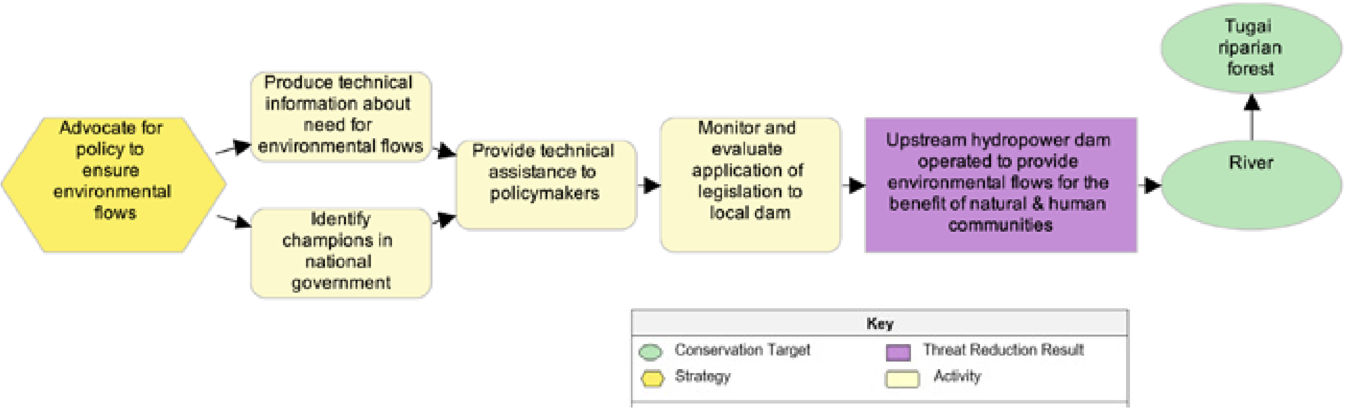
4. Verify That the Results Chain Meets the Criteria for a Good Results Chain

A good results chain should meet the criteria in Box 14. 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 strategy. This produces an implementation chain, not a results chain (Figure 26). An implementation chain does not show the causal logic that connects a strategy 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 or not your strategy is working.

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 strategy, 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.

FIGURE 26. EXAMPLE OF AN IMPLEMENTATION CHAIN



5. Include Climate Stresses in the Results Chain (Optional)

Your team's theory of change should show how your strategies will successfully conserve the conservation targets - but this will usually not include the elimination of climate change. 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 that will continue to be present. Keep in mind that you will not be able to reduce these climate stresses. Including them in your theory of change means that you believe that your strategy will be successful in spite of these climate stresses.

In our example (Figure 25) the team believes that incorporating environmental flows into the management of the upstream hydropower dam will ensure that the river and tugai riparian forest will receive enough water (especially during dry periods), even as the local climate becomes drier. In this case, their results chain includes "Less precipitation in upper catchments," not as a desired result, but rather as a climate impac that the team cannot avoid – for this reason it is in red text.

6. Share and Refine Your Results Chain

As stated earlier, 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 strategies, or key stakeholders. They may challenge some of your assumptions and their input will improve the quality of your chain.

CRITERIA FOR GOOD GOALS AND OBJECTIVES — BOX 15.

- *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

KEY TERMINOLOGY

INDICATOR: A measurable entity related to a specific information need, such as the status of a target, change in a threat, progress toward an objective, or association between one or more variables. A good indicator meets the criteria of being: measurable, precise, consistent, and sensitive.

OBJECTIVE: A formal statement detailing a desired outcome of a project, such as reducing a critical threat or decreasing vulnerability to climate change. A good objective meets the criteria of being specific, measurable, achievable, results-oriented, and time-limited (SMART).

7. 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 outcomes. 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 15). 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 strategy 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 conservation 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 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 strategy 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 climate adaptation strategy.

8. 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 11 and Figure 27). 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

TABLE 11. OBJECTIVES AND INDICATORS FOR ENVIRONMENTAL FLOW RESULTS CHAIN

Result	Objective	Indicator	Monitoring Methods
Champions in national government advocate for environmental flows	Obj 1. By the end of 2022, at least 5 champions in the national government are advocating for the incorporation of environmental flows into the operation of hydroelectric dams.	# of champions in the national government who are advocating for the incorporation of environmental flows into the operation of hydroelectric dams	key informant interviews with government officials
Environmental flows established as a "beneficial use" on par with other water uses	Obj 2. By the end of 2022, environmental flows have been legally established as a "beneficial use" with equal standing to other water uses.	legal mechanism established	legislative records
Policy approved to require environmental flows	Obj 3. By the end of 2024, an energy policy is approved that requires hydroelectric companies to incorporate environmental flows into their operations.	approved policy document	review government records
Plan developed incorporating environmental flows into dam management	Obj 4. By the end of 2026, the hydroelectric company has developed a plan for operating the dam in a way that maintains the ecosystem health of the river.	document and evidence of its approval	key informant interviews with representatives of the hydroelectric company and conservation organizations that provided technical assistance to the company
Upstream hydropower dam operated to provide environmental flows for the benefit of natural & human communities	Obj 5. By the end of 2027, the timing and flow rate of water releases from the hydroelectric dam are sufficient to meet the ecological needs of the river and tugai riparian forest.	timing and amount of downstream release flow rate	review hydropower company records

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 12 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 your conservation and human wellbeing targets, to which your strategies 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.

FIGURE 27. ECOLOGICAL FLOW RESULTS CHAIN WITH OBJECTIVES, GOAL, INDICATORS, AND MONITORING ACTIVITIES

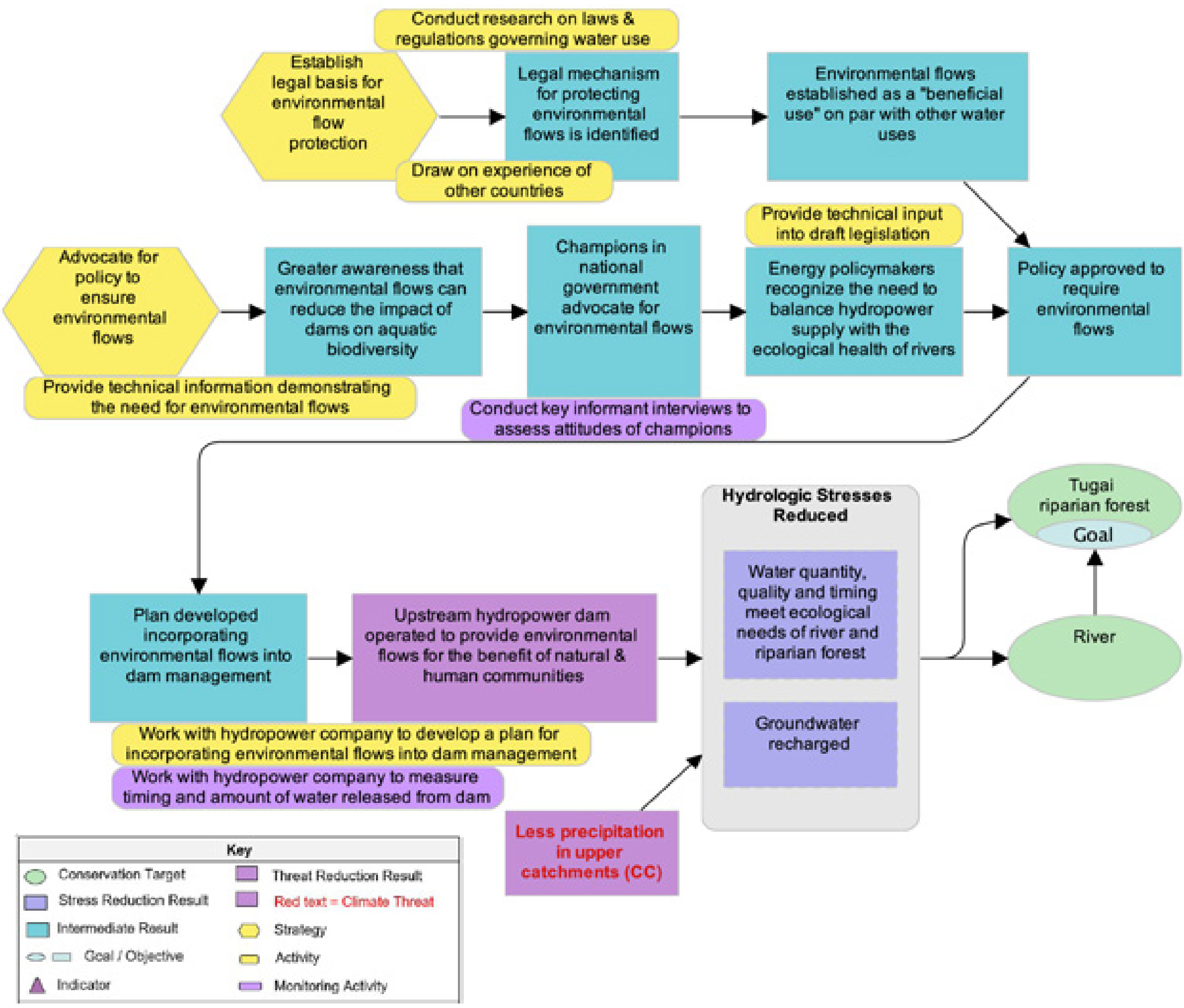


TABLE 12. EXAMPLE OF A MONITORING PLAN FOR A GOAL FOR THE TUGAI RIPARIAN FOREST ECOSYSTEM

Goal: By 2030, more than half of the area within 500 m of the river will be covered by tugai riparian forest, with an average density of 3-year saplings of at least 1 per m^2, a soil salinity of no more than 200 mS/m, according to the standard soil solution technique, and an annual flood period of at least 50 days.

Monitoring approach: Time series of remote sensing data and field measurements, semi-quantitative index

Indicator	Method	Baseline	Desired Level	Frequency	Responsibility
% of the area within 500 m of the river that is forested	Analysis of remote imagery	35%	> 50%	Once every five years, early summer	TSNR administration
Density of 3-year saplings per m^2	Ground survey (fixed sampling areas)	0.025	> 1	Annually (early summer)	Institute of Forestry, National Academy of Sciences
Electrical conductivity of soil solution (mS/m)	Standard laboratory analysis of soil samples (fixed sampling stations)	500	< 200	Annually	Institute of Forestry, National Academy of Sciences
No. of days per year with submerged forest surface (fixed sampling stations)	Ground survey of fixed and marked survey stations	12	> 50	Annually	TSNR administration

CRITERIA FOR A GOOD INDICATOR

BOX 16

- *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 3. Implement Your Strategies

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.[20] 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
- you seek and document lessons learned from your implementation (e.g., feasibility and effectiveness of certain strategies) and systematically record and share them throughout the conservation community

20 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. https://cmp-openstandards.org/

How to Develop a Work Plan & 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 strategies 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 the sequence of linked activities is
- where each activity will be implemented (are there travel or logistical considerations?)
- 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 strategies.

The most expensive resource for most projects will be staff time. However, you should also consider any other major expenses associated with your project's implementation, such as physical infrastructure or

FIGURE 28. WORK PLAN FOR ENVIRONMENTAL FLOW POLICY STRATEGY (# OF DAYS)

	Work Assignments	Work Units								
Item	Who	Jan	Feb	Mar	Q1	Q2	Q3	Q4	2021	Total
Environmental Flow Policy Strategy	Fariza, Umed, Baktygul	45	45	45	135	60	60	60	315	315
Advocate for policy to ensure environmental flows	Baktygul, Fariza, Umed	30	30	30	90	10	40	40	180	180
Provide technical information demonstrating the need for	Baktygul, Fariza, Umed	15	15	15	45				45	45
Produce educational materials about environmental flows	Fariza	15	15	15	45				45	45
Provide technical input into draft legislation	Umed					10	40	40	90	90
Work with hydropower company to develop a plan for inc	Baktygul									
Establish legal basis for environmental flow protection	Umed	15	15	15	45	50	20	20	135	135
Conduct research on laws & regulations governing water	Umed*	15	15	15	45	20	10	10	85	85
Draw on experience of other countries	Umed					30	10	10	50	50

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 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 parts 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 3A 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 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.

21 https://fosonline.org/library/work-plan-budget/

Example Work Plan and Budget

Figure 28 shows a work plan developed for the strategy: "Advocate for policy to ensure environmental flows." For each activity, the table shows how many days each project team member will need to dedicate to implement the activity and when they will do this work. In this case, the conservation organization has three employees who will work together to implement the strategy. One of them has a background in communications and will lead the production of outreach materials, another is an environmental lawyer who will work to establish the legal basis for environmental flows, and the third is a hydrologist who will work with the hydropower company to develop a plan for incorporating environmental flows into the operation of their dam.

The table in Figure 29 adds the expenses for each activity, including: "Provide technical information" and "Produce educational materials." Additional guidance on developing a work plan and budget is available in Developing High-level Work Plans and Budgets: An FOS How-to Guide.[21]

FIGURE 29. WORK PLAN AND BUDGET FOR ENVIRONMENTAL FLOW POLICY STRATEGY

	Work Assignments	Work Units						Projected Expenses						Budget Totals
Item	Who	Q1	Q2	Q3	Q4	2021	Total	Q1	Q2	Q3	Q4	2021	Total	Total
Tigrovaya Balka for threat rating (v0.4)	Fariza, Umed, Baktygul	135	60	60	60	315	315	6,000	2,000	2,000	2,000	12,000	12,000	12,000
Environmental Flow Policy Strategy	Fariza, Umed, Baktygul	135	60	60	60	315	315	6,000	2,000	2,000	2,000	12,000	12,000	12,000
Advocate for policy to ensure environmental flo	Baktygul, Fariza, Umed	90	10	40	40	180	180	6,000	2,000	2,000	2,000	12,000	12,000	12,000
Provide technical information demonstrating the	Baktygul, Fariza, Umed	45				45	45	5,000	1,000	1,000	1,000	8,000	8,000	8,000
Materials for hydrologic data collection								5,000	1,000	1,000	1,000	8,000	8,000	8,000
Produce educational materials about environmen	Fariza	45				45	45	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
Provide technical input into draft legislation	Umed		10	40	40	90	90							0
Work with hydropower company to develop a pla	Baktygul													

Step 4. Analyze & Adapt Your Plan

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.[22]

As your team engages in the project, you should pass through all of the steps multiple times. We recommend your team sets aside a regular time to reflect on what you have learned from your implementation and adapt your future strategies accordingly. In addition to adjusting your climate adaptation strategies, 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 strategies. The amount of time needed to complete this step is often underestimated by project managers, leaving them with a lot 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.

22 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. https://cmp-openstandards.org/

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 models and results chains)? 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 identified strategies that perfectly address the threats and opportunities affecting your conservation 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 strategies and activities as needed. As you make changes, you should 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

In our example project in Central Asia, a small team of conservation lobbyists (Fariza, Baktygul, and Umed), set out to advocate for a national policy that would ensure improved water flows to the river and the tugai riparian forest. After the first year of work on this strategy, they sat down to systematically discuss their progress and the challenges they had faced, in a "reflect and adapt" session. They rated their progress in implementing each activity (Figure 30), as well as the degree to which they had achieved the desired results (Figure 31).

They had spent nearly a year providing technical information to politicians to promote awareness of the problem and identify champions. The activity seemed to be on track, but they realized that they had only partially achieved their objective of securing five champions in the national government. They decided they needed an additional activity to build a coalition of stakeholders to inspire their potential champions (which they added to the results chain, as shown in Figure 31). They hired a new person to help them build this coalition and it was a success. By the next year's "reflect and adapt" session they had all of their champions and the policy was on track for approval.

Every year the team came together for another "reflect and adapt" session. Once the champions had been identified, the strategy had progressed quickly. The team's activities stayed mostly 'on track' and the policy was easily approved once the stakeholder coalition made it politically popular. The team even achieved their third objective a year early when one of their national government champions gave the hydroelectric company a very short timeframe to develop their plan to comply with the new policy. However, during the team's fourth "reflect and adapt" session, they realized that something was wrong. While they had implemented all their activities and achieved the first three objectives, they were still not seeing the water releases necessary to meet the ecological needs of the river and the tugai forest. As a result, the viability of the KEAs of their conservation targets continued to decline.

They realized that while the policy had passed and a plan was developed, it had never been sufficiently implemented. The managers of the hydropower company had developed the plan quickly and never

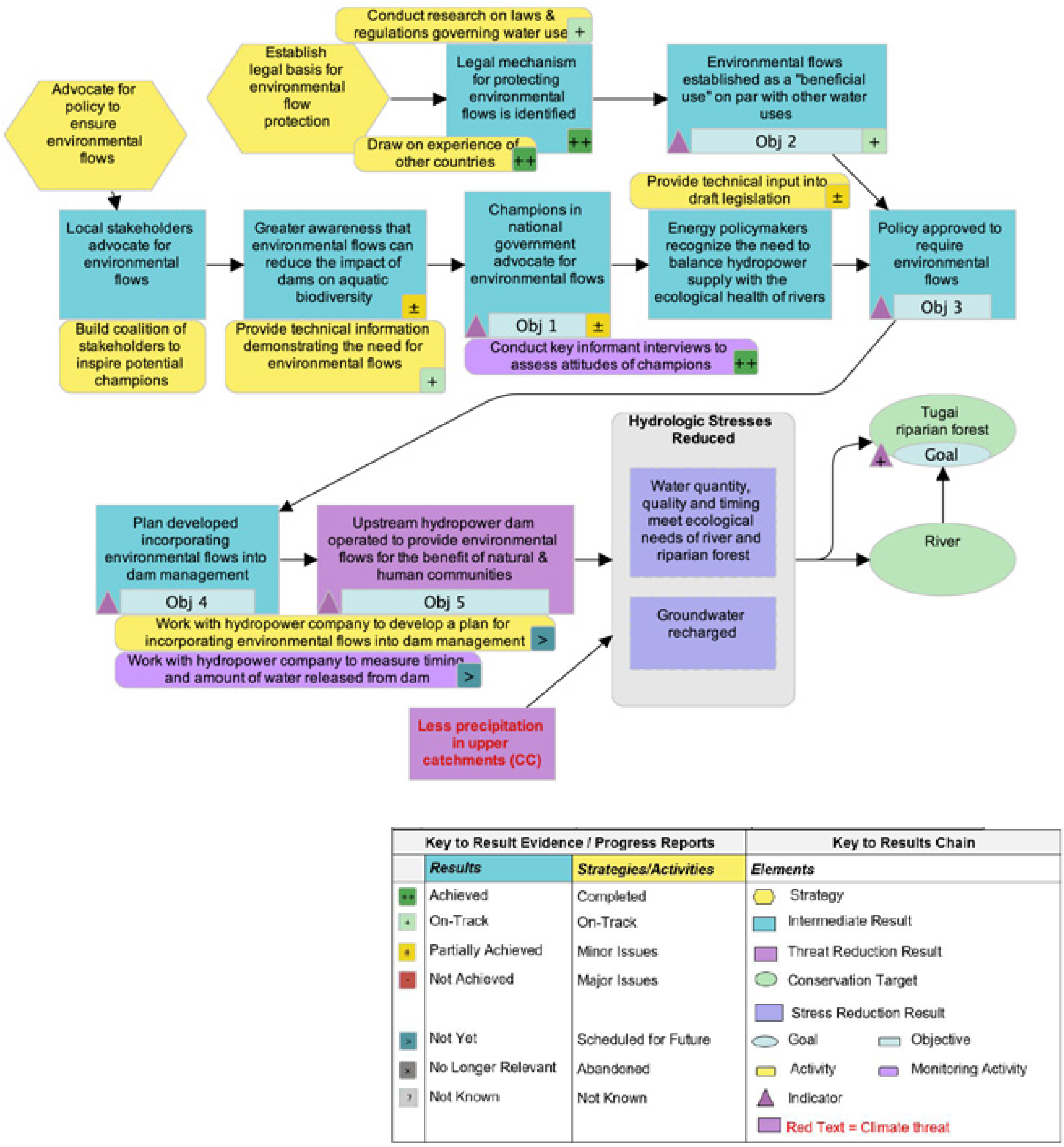
FIGURE 30. EXAMPLE OF PROGRESS REPORTING IN TABLE FORMAT

Item	Progress	Progress Details
Tigrovaya Balka for threat rating (v0.4)	Not Specified	
Environmental Flow Policy Strategy	Not Specified	
Advocate for policy to ensure environmental flows	Not Specified	
Provide technical information demonstrating the need for	On-Track	Hydrologic reseach has begun and is generating good information. A summary report has been shared with government representatives.
Produce educational materials about environmental flows	Major Issues	Outreach materials produced and distributed, but hydropower company is producing contradictory information, claiming that meeting environmental flow requirements will make electricity rates rise steeply.
Provide technical input into draft legislation	Minor Issues	There have been delays in drafting legislation, because the staff of Congressmen sponsoring the legislation have needed to work on other priority bills.
Work with hydropower company to develop a plan for inc	Scheduled	
Conduct key informant interviews to assess attitudes of c	Completed	Key informant interviews show that government representatives are not convinced of the need for environmental flow legislation
Establish legal basis for environmental flow protection	Not Specified	
Conduct research on laws & regulations governing water	On-Track	Research is underway and progress has been made in identifying possible legal basis for environmental flows.
Draw on experience of other countries	Completed	South Africa and the United States provide interesting cases.

trained their employees on the new guidelines. The process was also complicated, so even those who understood the procedure often preferred to do things the old, familiar way. In order for their strategy to be successful, they needed to find a way to motivate the hydroelectric company to fully implement the plan.

Conducting a "reflect and adapt" session at least once per year allows teams to analyze what has worked and what has not worked and adapt their work to increase their effectiveness. In this case, the team decided to analyze the barriers to the hydropower employees implementing the plan.

FIGURE 31. EXAMPLE OF PROGRESS REPORTING USING RESULTS CHAIN



Step 5. Learn & Share

Learn and Share to Improve Conservation

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

Hint: As more project teams use the climate-smart conservation practices, the learning community will grow and contribute more to the knowledge base and tools for later steps.[23]

Document and Share What You Learn

The long-term success of many climate-smart conservation projects will depend on the ability of conservation organizations and their stakeholders 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 has a record of what you did and what you learned. More importantly, it will also help the team avoid repeating past mistakes.

Therefore, it is critical 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 conservation community over time. It is also good practice to note any information gaps that need to be explicitly addressed when going forward. The documentation process is time-consuming, so it is imperative to provide both the time and the incentives to do this work.

Regularly sharing your results and learning with an appropriate external evidence base will help other practitioners using climate-smart conservation practices to benefit from your experience and avoid problems you may have encountered. This will ultimately allow them to achieve their adaptation goals more effectively. These results and knowledge could be recorded 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 conservation projects need to be effective through 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 climate-smart conservation practices 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 practitioners around the world.

23 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. https://cmp-openstandards.org/

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, you need a project environment that promotes evidence-based practice and adaptive management. This means that you, your team, and your organization should be regularly reflecting on what is working, what isn't, and why.
Creating a learning environment is not easy. It requires leaders and donors who understand the need to reallocate scarce resources to the long-term work of evidence-based conservation and adaptive management. It also often requires allowing practitioners to take chances and question the conventional wisdom related to specific tools and strategies. This includes providing project teams with a secure environment that enables them to be innovative and question assumptions. Most of all, it requires a commitment to share both successes and failures broadly in order to create true communities of practice.

Example of Practicing Adaptive Management

In our example from Central Asia, we saw that the team was able to keep their activities on track and achieve their initial results with very few challenges. It was only after four years of implementation that they realized that their strategy was not working. If they had not created a culture of learning from the beginning, and taken the time to pause and adapt through the good times, they could easily have missed the gaps in their approach.

After investing a significant amount of time and resources in trying to develop the policy, the team was determined to see it through. By reaching out to friends and colleagues, they quickly realized that many conservation projects face problems with compliance. By capitalizing on what they learned from other projects, they were able to develop a list of possible solutions and then use their understanding of the local context to select the most effective ones. In the end, they decided the most efficient approach was to co-develop an employee training program with the hydropower company's management team. They also created a platform for local communities to report on daily river flows so they would have more reliable information about changes in flow.

This team used their monitoring data to understand whether they were achieving the desired ultimate results of the strategy. When they realized there was a problem, they used that information to determine where the problem was and consider possible solutions. Rather than start from scratch, they used lessons from other projects to help them find potential solutions and adapt their approach. By documenting their own process, they also made it easier for future teams to learn from their experiences.

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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 APPROACH.

CMP Open Standards for the Practice of Conservation

- Conservation Measures Partnership (2020). *The Open Standards for the Practice of Conservation*, Version 4.0. The Conservation Standards provide an integrated approach and methodology for the design, planning, implementation, monitoring, and learning from biodiversity conservation projects and programs. 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 conservation practitioners to design, manage, monitor, and learn from their adaptation measures. The software was designed specifically for biodiversity conservation and natural resource management projects. It combines project design with operational planning, monitoring and learning functions. A full test version is available for free at www.miradi.org. The software is not necessary but it is very helpful.
- Miradi Share is a cloud based tool designed for seamless file sharing and learning among team members and as a resource for conservation practitioners everywhere to learn from one another's efforts. Miradi Share allows team members to collaboratively update their planning models. Program managers can use Miradi Share to roll up and look at data across their projects. Conservation practitioners can use publicly shared files as a starting point for designing and monitoring their own work. Soon, Miradi Share will have all of the features, including diagramming capabilities, that are currently available for Miradi desktop software. For more information, please visit www.miradishare.org.

Miradi Self-Guided Tutorial

- Conservation Measures Partnership and Sitka Technology Group (2016). Miradi self-guided tutorial. Miradi- Adaptive Management Software for Conservation Projects. www.miradi.org.

FOS Guidance on Conceptualizing Planning for Conservation

- 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://spark.adobe.com/page/6XaDPKyVS-jTfU/

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

- Conservation Coaches Network (2012). *Harmonized Conservation Standards Presentations.* Conservation Measures Partnership- Open Standards for the Practice of Conservation. http://cmp-openstandards.org/guidance/basic- open-standards-presentations-cc-net-2012/.

CMP Guidance on Human Wellbeing in Relation to Ecosystem Management

- Conservation Measures Partnership (2016). *Incorporating Social Aspects and Human Wellbeing in Biodiversity Conservation Projects. Version 2.0.* Conservation Measures Partnership- Open Standards for the Practice of Conservation. http://cmp-openstandards.org/guidance/addressing-human-wellbeing/.

Annex 2. Using Climate Data From General Circulation Models

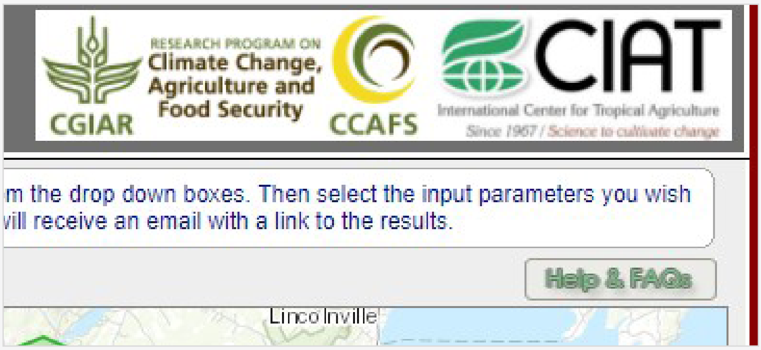
Climate change projections for the local area are required for the scenario planning (see Step 1E of this manual). It is best to work with a climate scientist to produce this information. Climate scientists typically develop projections by running a full suite (20-30) of GCMs (general circulation models) that they can downscale to make them relevant to the planning area. However, many climate scientists do not run projections that are useful for climate-smart conservation planning. There are a few things the core team should be aware of and ask for when working with a climate scientist.

- 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 conservation planning. Longer-term climate change projections can 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.
- You will also need to have projections by month and by 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 people 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 1E). It is important that the climate scientist provides projections that explicitly include the range of outputs among models to make the best use of the method.
- It is important to have projections for climate variables that are most relevant to local ecosystems and livelihoods. Climate scientists may only provide average daily temperatures for a particular month, when nighttime 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.

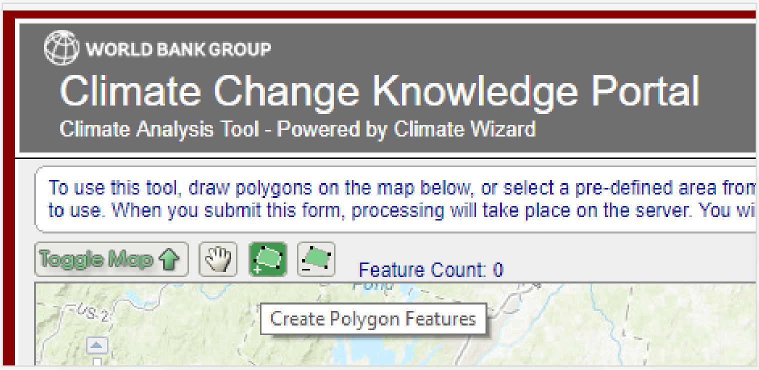
Annex 3. Instructions for Using Climate Wizard to Develop Climate Scenarios

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.[24] IF YOU ENCOUNTER PROBLEMS USING CLIMATE WIZARD, CONTACT EVAN GIRVETZ.[25]

1. Open Climate Wizard[26]
   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):



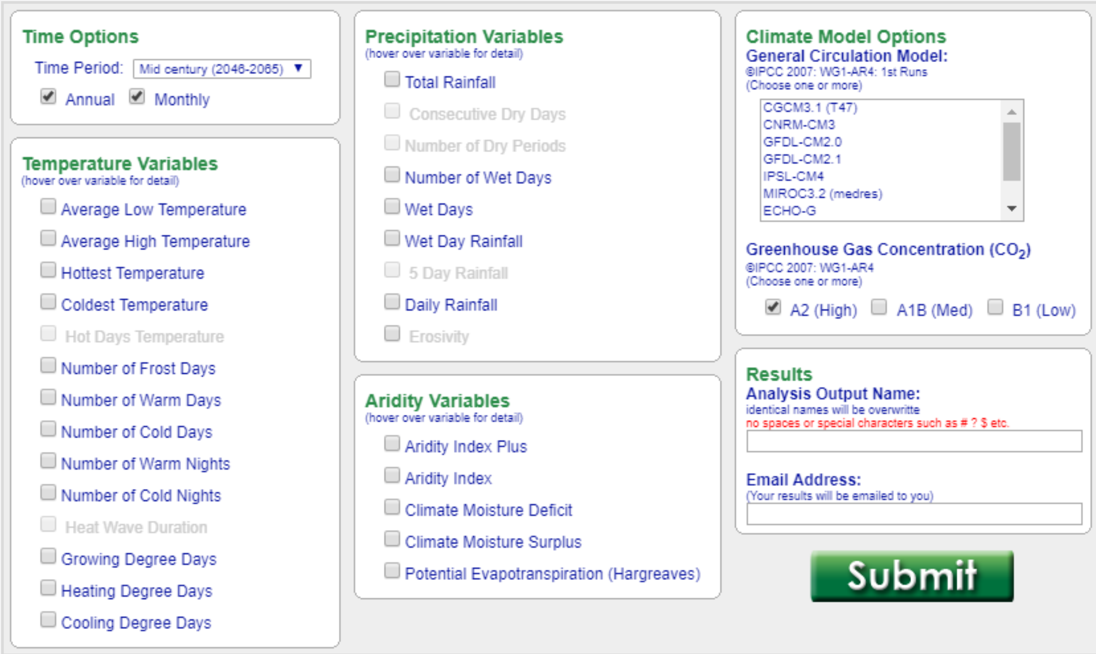
3. When finished, assign your polygon a name.

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.

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

25 e.girvetz@cgiar.org

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



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**.

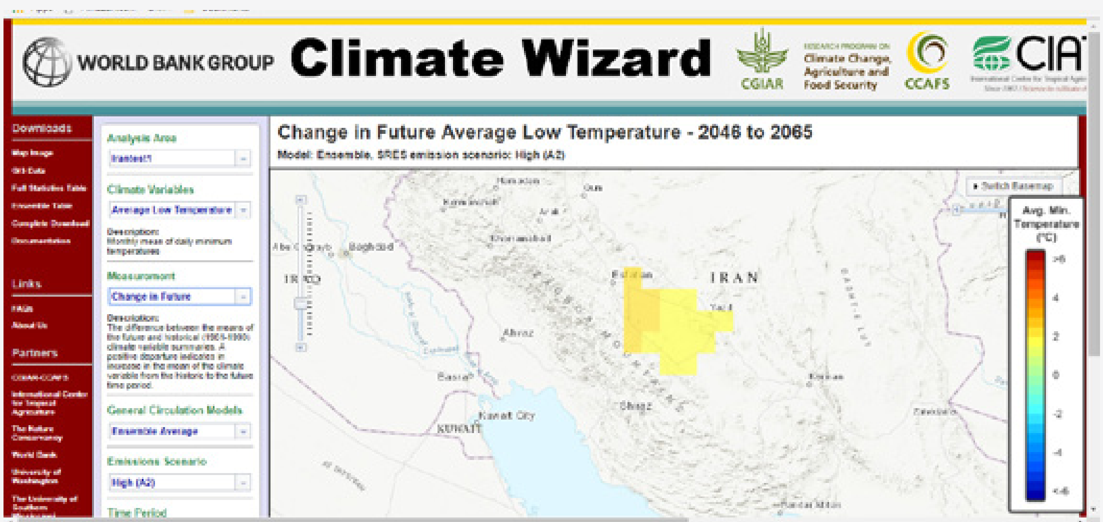
f. For the exercise, select SRES **GHG Concentrations** "A2 (High)." Note that these GHG concentrations are "outdated" (the current technique is to work with Representative Concentration Pathways), but they will work perfectly well for our efforts to examine variability between the models.

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. It can take anywhere from a 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 your climate scenarios, take a 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. Here, we want to identify those variables that the models show have the most variability (= future uncertainty) among the variables that you selected that are important for either ecosystems or people (or both).

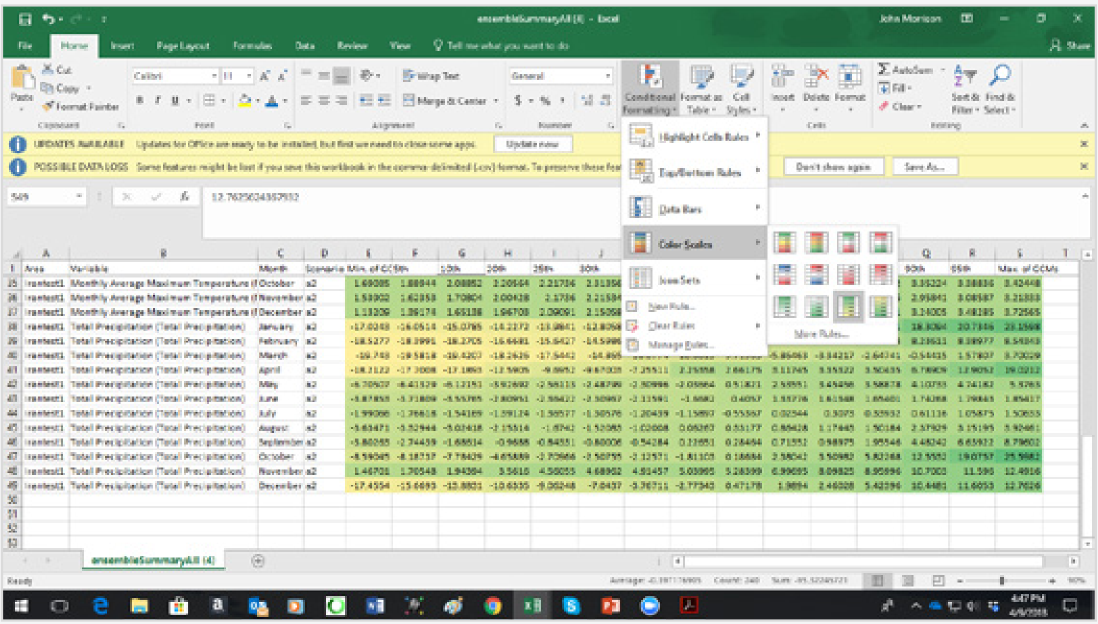
11. A suggestion for reviewing the output: highlight all of the cells associated with any one variable.

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. An example of an Excel Ensemble Table that shows conditional formating is shown below.

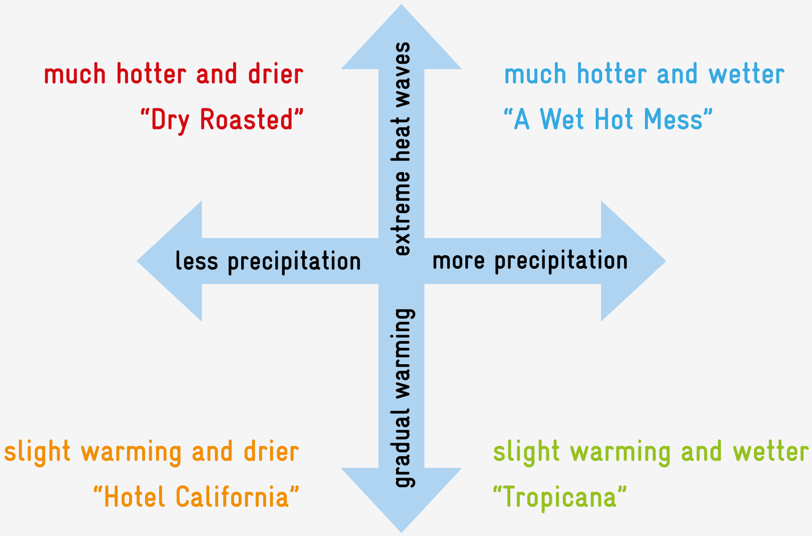
13. For each variable, for the month/season that is of most interest to your site, outline the values in the 10th and 90th (or 20th and 80th) percentiles. We will ignore the lower and higher values as outliers.

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.

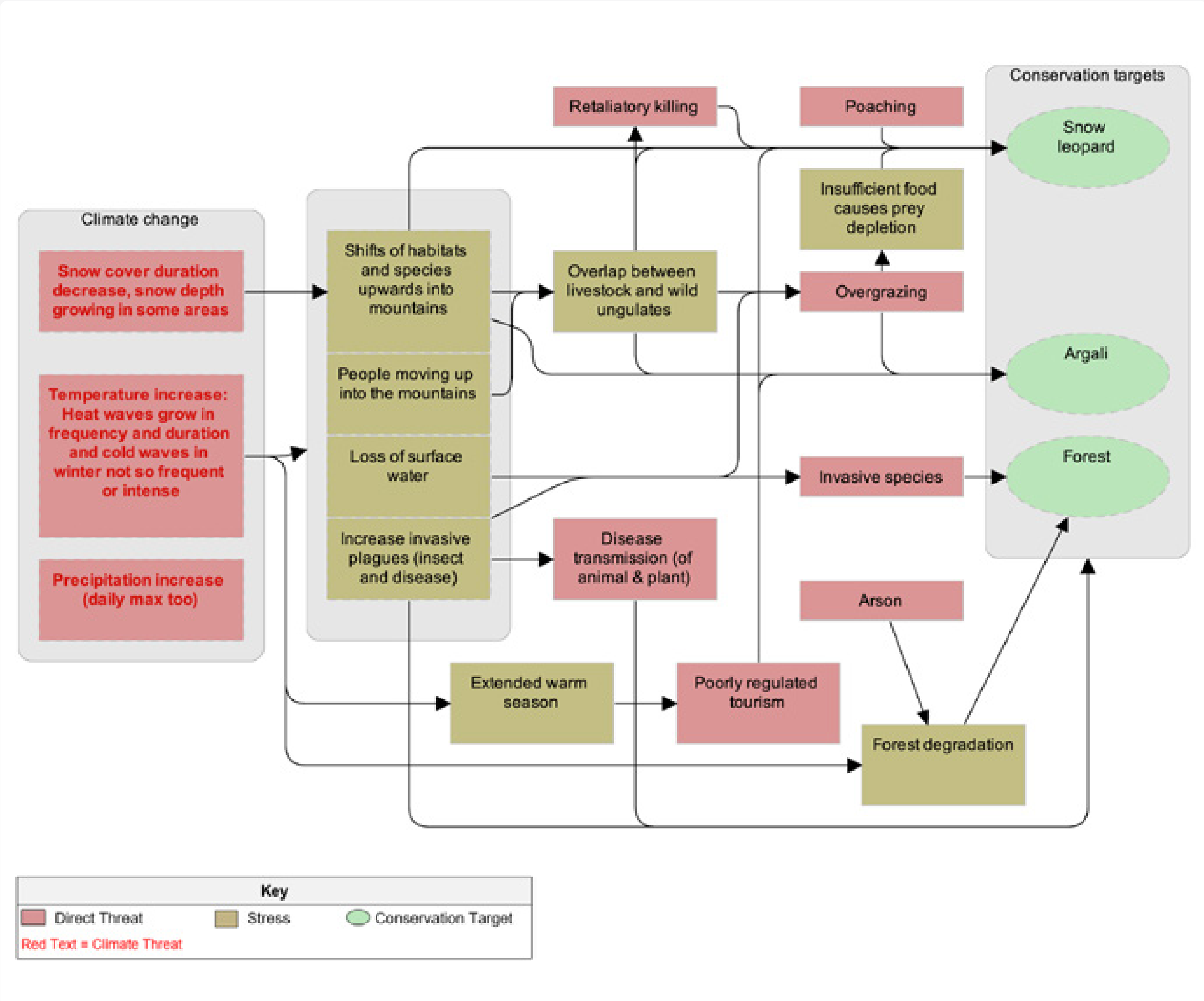


Excel Ensemble Table Showing Conditional Formatting



Parameter Quadrant for Scenario Planning

Annex 4.
Situation Model Example



The figure above represents a portion of a situation model from a steppe ecosystem in Asia. This situation model contains only climate threats, conventional threats, and the stresses caused by those threats. Stripped of the contributing factors, the diagram highlights the conventional and climate threats to three conservation 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 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 5. Glossary

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: Changes of climatic parameters of an area over the long term (> 30 years).

Climate refugia: "Habitats that components of biodiversity retreat to, persist in and can potentially expand from under changing environmental conditions" (Keppel et al., 2012). Refugia are characterized by their ability to provide long-term (over several generations) mitigation of environmental changes that make surrounding areas unsuitable.

Climate robust strategy: A strategy 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 accumulation).

Climate vulnerability: The potential of an ecosystem, species, or human community to be harmed by climate change. It can be defined as a function of the exposure of an ecosystem or community to a climate change related hazard, its sensitivity to it, and its adaptive capacity**.**

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

Conservation target: An element of biodiversity (species, habitat, or ecological system) at a project site on which a project has chosen to focus. All targets should collectively represent the biodiversity of concern at the site. (Synonymous with biodiversity target, conservation focus, or conservation value).

Contributing factor: An indirect threat, opportunity, or other important variable that positively or negatively influences conventional threats. 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 indirect threat and opportunity).

Conventional threat: A human activity that directly and negatively affects the viability of a target. Here we use the term "conventional" to designate those threats that are not related to climate change.

Core team: A small group of conservation practitioners, a trained facilitator, and other stakeholders and experts who take charge of the planning process.

Ecological drawing: A drawing of the project scope. It focuses on the conservation targets and may include human communities and natural resource management activities.

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

Ecosystem service: Service that intact, functioning ecosystems, species, and habitats provide and that can benefit people.

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

General Circulation Model (GCM): A numerical model representing physical processes in the atmosphere, ocean, cryosphere, and land surface, for simulating the response of the global climate system to increasing GHG concentrations. GCMs depict the climate using a three dimensional grid over the globe typically having a horizontal resolution of between 250 and 600 km, 10 to 20 vertical layers in the atmosphere, and sometimes as many as 30 layers in the oceans. Their resolution is thus quite coarse (Intergovernmental Panel on Climate Change)[27].

Goal: A formal statement detailing a project's desired impact, such as the desired future status of a target. A good goal meets the criteria of being specific, measurable, achievable, results-oriented, and time-limited (SMART).

Human wellbeing target: Those components of human wellbeing affected by the status of conservation targets. All human wellbeing targets at a site should collectively represent the array of human wellbeing needs dependent on the conservation targets.

Indicator: A measurable entity related to a specific information need, such as the status of a target, change in a threat, progress toward an objective, or association between one or more variables. A good indicator meets the criteria of being: measurable, precise, consistent, and sensitive.

Indirect threat: A factor identified in a situation analysis that is a driver of conventional threats. It is often an entry point for conservation actions (e.g., logging policies, human population growth).

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

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

Maladaptation: "An adaptation that does not succeed in reducing vulnerability but increases it instead" (McCarthy et al. 2001). Maladaptation includes actions that, relative to alternatives, exacerbate stresses on ecosystems and species, include taking actions that later prove to be ineffective under new climate conditions or push the problem downstream (e.g., engineered solutions to flooding that exacerbate stormwater runoff).

Maladaptive strategy: A strategy that causes harm to socio-ecological systems, i.e., that fosters adaptation in the short-term but insidiously affects systems' long-term vulnerability and/or adaptive capacity 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.

Objective: A formal statement detailing a desired outcome of a project, such as reducing a critical threat or decreasing vulnerability to climate change. A good objective meets the criteria of being specific, measurable, achievable, results-oriented, and time-limited (SMART).

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 (http://cmp-openstandards.org/).

Opportunity: A factor identified in a situation analysis that is a driver of a conventional threat, and is often an entry point for conservation actions (e.g., logging policies, human population growth). (In some senses, the opposite of a threat.)

Prediction (of climate change): A climate parameter for which all consulted general circulation models (GCMs) agree for the given time frame. If all GCMs project similar results for a specific parameter (e.g., temperature), then these 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 future state of a target or factor. Results include impacts, which are linked to targets and outcomes, which are linked to threats and opportunities.

27 https://ipcc-data.org/guidelines/pages/gcm_guide.html

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

(Climate) Scenario: 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 conservation targets in order to identify uncertainty and plan climate-smart strategies, monitoring, and adaptation.

Situation analysis: A process that will help you and your project team create a common understanding of your project's context – including describing the relationships among the biological environment and the social, economic, political, and institutional systems and associated stakeholders that affect the conservation targets you want to conserve. Depending upon the scale of the project and the resources available to it, a situation analysis can be an in-depth formal review of existing evidence and study of the area/problem or a less formal description based on input of those familiar with the area/problem.

Situation model: A visual diagram of a situation analysis. A situation model (diagram) represents relationships between key factors identified in a situation analysis believed to impact or lead to one or more conservation targets. A good model should link the conservation targets to threats, opportunities, stakeholders, and key intervention points.

Scope: The broad parameters or boundaries place-based, target-based, and thematic-based of a project.

Seasonal calendar: A simple 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, where relevant. It provides information about how humans depend on ecosystems for their wellbeing.

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

Sometimes effective strategy: A strategy 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 agricultural areas but will not be helpful -- or harmful -- if precipitation increases and fields get waterlogged for weeks at a time).

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

Stress: An impaired aspect of a conservation target that results directly or indirectly from conventional threats or climate changes. Examples of stresses include low population size, reduced river flows, increased sedimentation, and lowered groundwater table level. A stress is also generally equivalent to a degraded key ecological attribute.

Theory of change: A series of causally linked assumptions about how a team thinks its actions will help it achieve both intermediate results and longer term conservation and human wellbeing goals. A theory of change can be expressed in text, using a diagram, or with other forms of communication.

Threat: A human activity that directly or indirectly degrades one or more targets. Typically tied to one or more stakeholders. (See also <u>conventional threat</u>, <u>indirect threat</u>, and <u>climate threat</u>).

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

Vision statement: A general statement of the desired state or ultimate condition that a project is working to achieve. A climate-smart project vision statement would commonly include references to the resilience of ecosystems, species, and ecosystem services and the human communities that depend on them, in the face of climate change (or change in general). A good vision statement meets the criteria of being relatively general, inspirational, and brief.

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

Annex 6. References

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