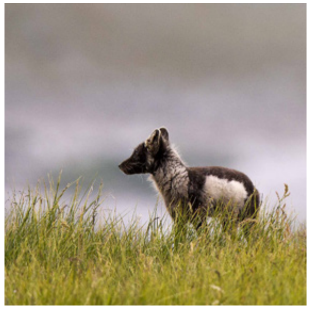
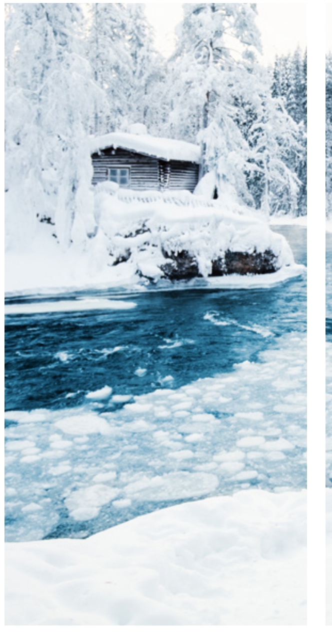
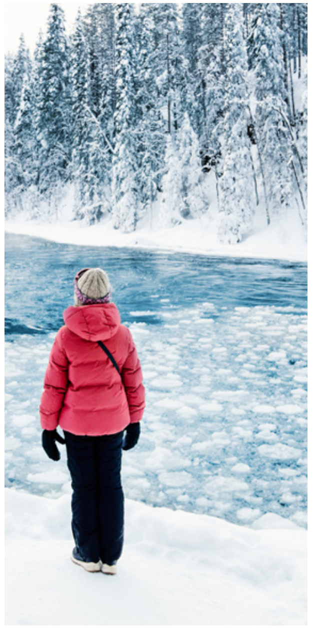
Climate Change Adaptation Planning

A Handbook with Examples from Arctic Protected Areas







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Hiking over mires in Reisa National Park.
PHOTO: Nina Storm

Introduction

Climate change is altering the environmental conditions that protected area managers have relied on for decades. Rising temperatures, changes in snow and rainfall patterns, and more frequent and intense extreme weather events are challenging the ability to meet traditional conservation goals and manage the resources of National Parks and Nature Reserves.

CLAP – *Climate change communication and adaptation of Arctic protected areas* – was a cross-border project between 2024-2026, co-funded by EU's Interreg Aurora program.

The main goal of CLAP was capacity building in climate change and climate change adaptation planning in Project partners' own organizations. The goal was achieved by creating and implementing a training programme and by piloting adaptation planning in five protected areas. The project also included piloting climate-wise solutions and developing visitor centres' climate change communication.

One of the results of the project is this handbook. It focuses on scenario-based climate change adaptation planning as a means to address climate uncertainty. This methodology was developed by the U.S. National Park Service (NPS) within their Climate Change Response Program (CCRP). During the CLAP project, this methodology was chosen for learning and piloting climate change adaptation.

The handbook briefly describes four other adaptation planning methodologies for protected areas before an in-depth description of the NPS' methodology. Each pilot planning process is then presented, including key learnings and advice for future work. The handbook also includes a description of the training course *Planning for a changing climate,* which was developed during the CLAP-project with the help of the National Park Service. Terminology used in the handbook is explained in a glossary, and there is a reference list with links to reports and other useful material.

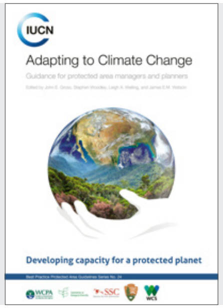
This handbook documents the capacity building within the CLAP project for future use by managers of protected areas and others interested in climate change adaptation planning in protected areas.

CLAP Project partners:

The County Administrative Board of Norrbotten, Sweden.
Metsähallitus Parks and Wildlife, Finland.
Reisa National Park Board, Halti National Park Center and County Governor of Troms and Finnmark, Norway.

Methodologies for Climate Change Adaptation

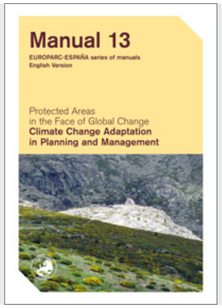
Over the past decade, several organizations have developed methodologies for climate change adaptation in protected areas. These methodologies are designed for managers and planners and can be adjusted to fit the specific conditions and practices of each protected area. This chapter will give a short overview, including some useful examples, and a comparison of five different methodologies.



METHODOLOGY 1

Adapting to Climate Change: Guidance for Protected Area Managers and Planners

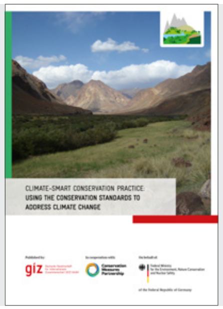
INTERNATIONAL UNION FOR CONSERVATION OF NATURE (IUCN), 2016



METHODOLOGY 2

Protected areas in the Face of Global Change: Climate Change Adaptation in Planning and Management

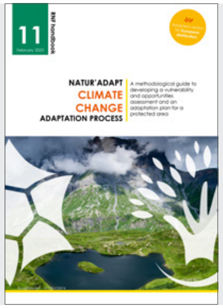
EUROPARC SPAIN, 2020



METHODOLOGY 3

Climate smart conservation practice: using the conservation standards to address climate change

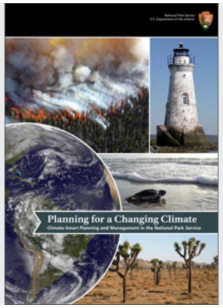
GIZ AND CONSERVATION MEASURES PARTNERSHIP, 2020



METHODOLOGY 4

Natur'Adapt Climate change adaptation process

LIFE NATUR'ADAPT PROJECT, 2023



METHODOLOGY 5

Planning for a Changing Climate: Climate-Smart Planning and Management in the National Park Service

US NATIONAL PARK SERVICE, 2020

Five methodologies for addressing climate change

METHODOLOGY 1

Adapting to Climate Change: Guidance for Protected Area Managers and Planners

INTERNATIONAL UNION FOR CONSERVATION OF NATURE (IUCN), 2016

The *Adapting to Climate Change* guide offers a comprehensive methodology to help protected area (PA) managers respond to climate change. It emphasizes that climate change is a major threat to biodiversity and ecosystem services, and that protected areas are both vulnerable to its impacts and essential for mitigation and adaptation.

The adaptation process starts by assessing the current situation and resources. Vulnerability and risk assessments are used for recognizing key vulnerabilities for species and nature types, and for making informed decisions to reach conservation goals.

When selecting adaptation strategies, the approach stresses tailoring them to local contexts but also consider broader landscape connectivity and resilience perspectives. Implemented actions need to be monitored for continuous learning. The process is illustrated in Figure 1.

The approach encourages managers to reconsider conservation goals, integrate climate considerations into existing planning, and focus on future conditions rather than historical baselines.

Categorizing adaptation strategies helps to prioritize adaptation options. Adaptation strategies can be categorized based on the magnitude of observed or projected changes, and the intensity of the management effort, (Figure 2).

Figure 2. Example of categorizing potential adaptation strategies

Strategy no. 1 is appropriate when applying current best practices will help to retain ecological values, whereas strategy no. 2 assumes the ecological value will not persist without active intervention. When ecosystems are undergoing significant ecological changes driven by climate change, strategy 3 suggests re-writing management goals to accommodate climate impacts. When climate change is already pervasive and protected area values are about to change, strategy 4 comes to play and suggests new conservation goals, based on the revised values of the protected area.

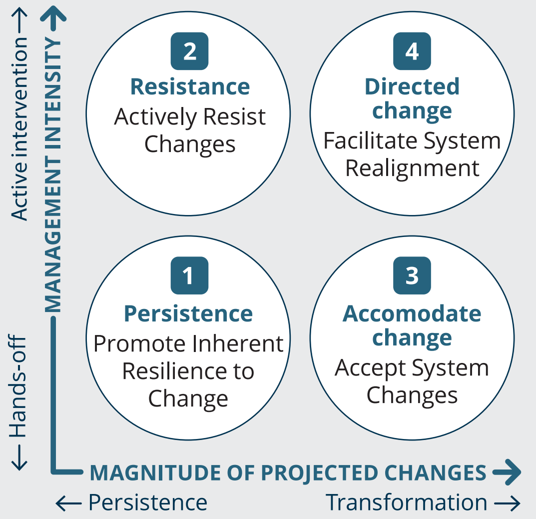
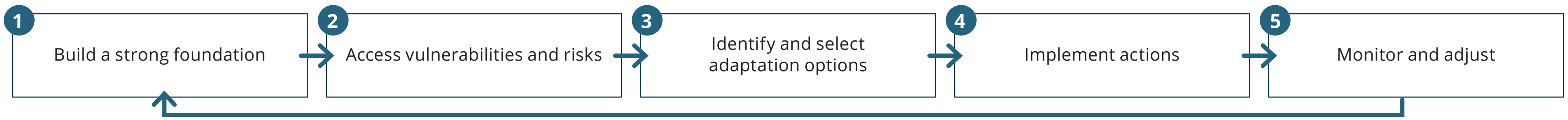


Figure 1. Illustration of process steps (IUCN)



METHODOLOGY 2

Protected areas in the Face of Global Change: Climate Change Adaptation in Planning and Management

EUROPARC SPAIN, 2020

The *Climate Change Adaptation in Planning and Management* manual discusses how to integrate climate change adaptation into the planning and management of protected areas in Spain. It emphasizes the urgency of addressing climate change as part of the broader phenomenon of global change, which includes land use changes, pollution, invasive species, and biogeochemical alterations.

The manual talks about an ecosystem-based adaptation approach, focusing on maintaining healthy, resilient ecosystems that can buffer climate impacts and continue providing essential services.

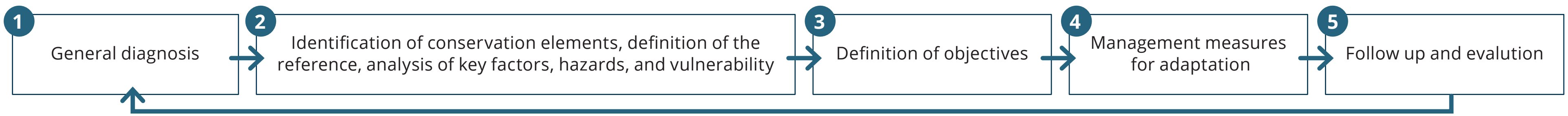
The methodology is based on literature review, surveys of managers and researchers, analysis of tens of management plans, and several projects and pilots. The manual proposes a cascade planning model and offers planning guidance ranging from generic and more strategic documents to those that are more specific and operational. One example provides a simple way to assess vulnerability (Table 1). The manual suggests a planning process where climate is considered in every step of the planning (Figure 3).

Table 1. Example of vulnerability assessment at Monte Matagalls

A vulnerability assessment allows us to identify which climate metrics impact the conservation object and how they do it. Thus, adaptive capacity and vulnerability can be rated. With the help of vulnerability assessments, it is easier to prioritize and make informed decisions about what actions to take. This example provides a simple way to assess vulnerability with traffic light colouring.

Conservation object	Exposure	Impact	Adaptive capacity	Vulnerability
Species, habitat, ecosystem	**Components of climate change that affect the conservation object**	**Foreseeable effect of exposure to climate change on the conservation object**	**The system's inherent capacity to respond to climate change (by genetic variability, changes in behaviour)**	**Overall evaluation resulting from discounting the capacity for adaptation from the impact**
Plant communities at edges of streams and wetlands	Precipitation reduction and increased evapotranspiration	Disappearance	Very low, with hardly any displacement capacity	Very high
High altitude meadows	Temperature increase and precipitation reduction	Biogeographic singularity. Displacement of distribution area towards higher altitudes.	Little possibility of displacement of distribution area, dependence on adequate livestock management	High

Figure 3. Illustration of process steps (Europarc Spain)



METHODOLOGY 3

Climate smart conservation practice: using the conservation standards to address climate change

GERMANY SOCIETY FOR INTERNATIONAL COOPERATION (GIZ) AND CONSERVATION MEASURES PARTNERSHIP, 2020

This guide integrates climate change considerations into the Conservation Measures Partnership's *Open Standards for the Practice of Conservation* (Conservation Standards). It provides a step-by-step methodology for conservation practitioners to design, implement, and adapt biodiversity conservation projects in the face of climate uncertainty (Figure 4).

The approach enhances traditional conservation planning by incorporating climate vulnerability assessments, scenario planning, and climate-smart strategy development. It emphasizes adaptive management, stakeholder engagement, and evidence-based decision-making.

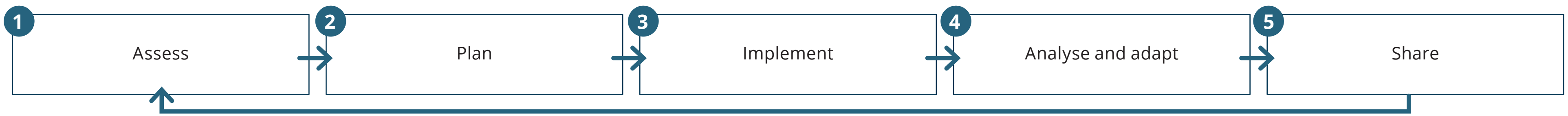
The guide is illustrated with a case study from the Tugai Strict Nature Reserve in Central Asia and includes practical tools like situation models, monitoring plans, and strategy rating matrices (Table 2). It encourages a flexible application depending on project context and capacity, aiming to improve the resilience of ecosystems and communities to climate change.

Table 2. Example rating of conventional and climate threats to ecosystems

This example combines the threats posed by climate change, and other threats, to conservation targets. The threat rating (low-medium-high) and the summary threat rating indicate which conservation targets face the biggest threats. This will help direct mitigation or adaptation actions to their greatest impact.

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
Summary target rating	**High**	**High**	**Medium**	**High**	**Medium**	**High**

Figure 4. Illustration of process steps (GIZ and Conservation Measures Partnership, 2020)



METHODOLOGY 4

Natur'Adapt Climate change adaptation process

LIFE NATUR'ADAPT PROJECT, 2023

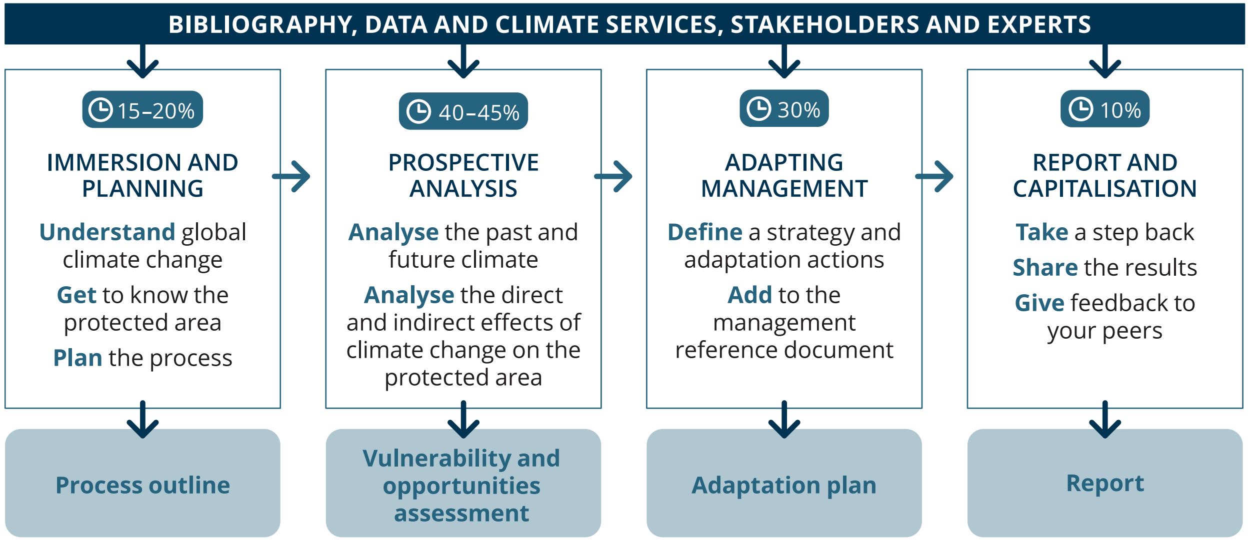
Natur'Adapt is a methodological guide for developing vulnerability and opportunities assessment and an adaptation plan for protected areas. It offers a practical methodology to integrate climate change adaptation into the management of protected areas and has been tested across 21 European sites (Figure 5).

The methodology is iterative and based on available knowledge, expert input, and stakeholder engagement. It encourages managers to adopt a forward-looking mindset—referred to as "putting on the climate change glasses"—to anticipate ecological shifts, rethink conservation goals, and adjust management practices accordingly.

The guide emphasizes flexibility, allowing users to adapt their tools and methods to their specific context, resources, and ambitions. It promotes collaboration, iterative learning, and integration with existing planning frameworks.

Figure 5. Examples of Steps and time allocation in the Natur'Adapt process

The Natur'Adapt process has four phases, each with a specific set of questions. The first phase covers understanding climate change and the protected area in general. The second phase is about analyzing climate change and its impacts on the protected area specifically. In the third phase, an adaptation strategy with actions is crafted. The last phase covers final reflections, report and feedback. The whole process is estimated to take 50 to 80 workdays, arching over 12 to 18 months.



Birch tree with Jierttágahpir mountain in the background in Reisa National Park. PHOTO: Nina Storm

METHODOLOGY 5

Planning for a Changing Climate: Climate-Smart Planning and Management in the National Park Service

US NATIONAL PARK SERVICE, 2020

The *Planning for a Changing Climate* guidance provides a structured, flexible framework for integrating climate change adaptation into planning and management. It stresses that adaptation should be mainstreamed into existing planning processes rather than treated as a separate effort. The methodology emphasizes scenario planning to address uncertainty and highlights the need to develop forwardlooking, climate-informed management goals. It also encourages intentional planning, adaptive management, stakeholder engagement, and continuous learning. Process steps are illustrated in Figure 6.

A useful tool described is the ResistAccept-Direct (RAD) framework. It is used to help managers consider a full spectrum of adaptation options, moving beyond traditional approaches that focus on resisting change by also considering accepting or directing change (Figure 7).

The NPS methodology is described in more detail in the next chapter.

Figure 7. How to know if a management action should be considered as Resist, Accept, or Direct

Adapted from Schuurman et al., 2020.

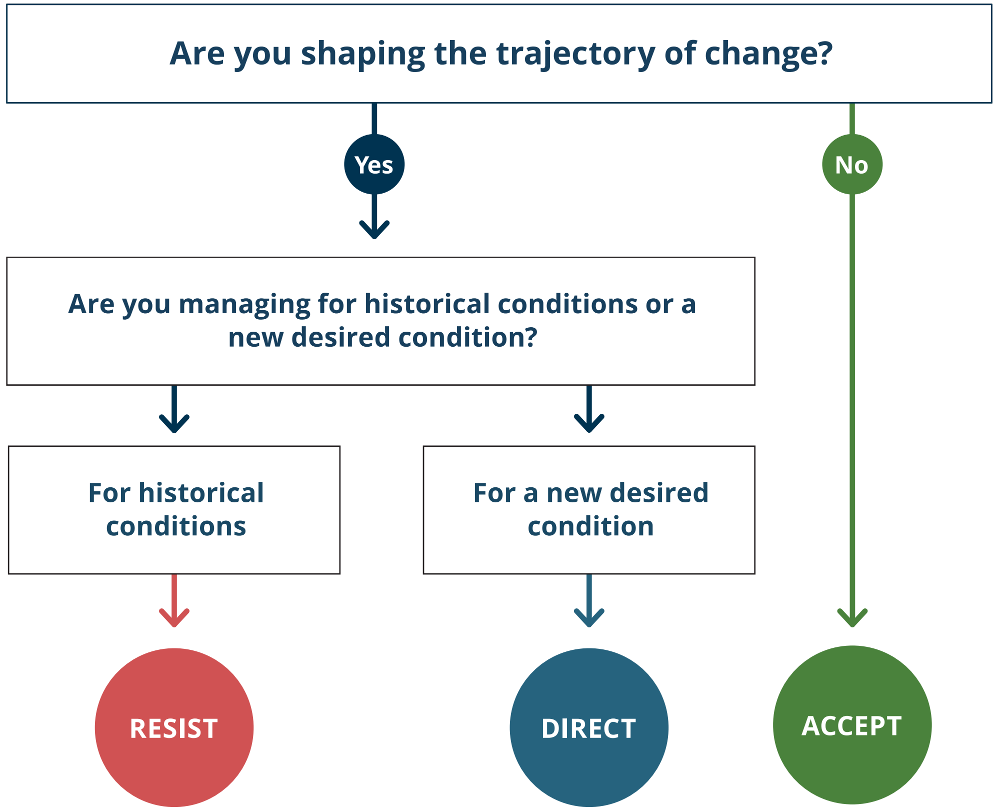
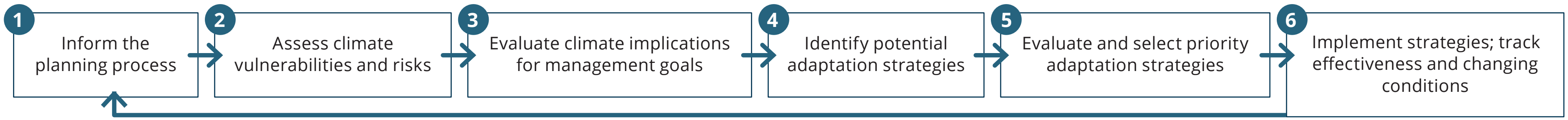


Figure 6. Illustration of process steps (US National Park Service)



Similarities between the adaptation methodologies

When taking a closer look at the different methodologies, they all share similar steps. In fact, some of them build on each other. The National Park Service has been involved in developing the IUCN methodology, and Natur'Adapt refers to the NPS methodology as well.

All methodologies include these components:

- Collecting information about the area and relevant climate data and defining the scope.
- Analysing climate impacts, including vulnerability/risk/threat assessments.
- Recommending the use of scenario planning.
- Goal revision, to various extent.
- Identification and selection of adaptation strategies.
- Implementation of strategies/plans.
- Monitoring and evaluating the plan.

All five methodologies are iterative because changing conditions require continuous adjustments of plans. Long-term planning and monitoring provide the feedback needed to understand whether actions are working as intended to detect emerging impacts or new vulnerabilities, and to adjust strategies accordingly. In addition, the methodologies require interdisciplinary teams, recommend some level of stakeholder engagement and are scalable for different scopes and needs.

A group of adaptation practitioners in the U.S. recently conducted a similar analysis of different adaptation planning methodologies and tools used by different land management agencies. They noted similar findings in relation to the key components of adaptation planning (Miller et al. 2025).

Factors that influence labour intensity and total time required in all five methodologies are:

- the level of stakeholder engagement,
- the creation and use of scenarios,
- the depth of the analysis and assessments,
- the amount of available data,
- experience of the adaptation planning methodology.

The methodologies differ in how much additional material is available beyond the methodology report. Only the IUCN report, Natur'Adapt, and the NPS methodology are supported by websites, with the NPS site offering the most extensive information. The NPS also provides YouTube videos and additional publications online.

CONCLUSION

Since methodologies developed for climate change adaptation in protected areas are similar and scalable, either one should work for most planning efforts. Using an existing methodology together with available and relevant tools is recommended for planners and managers of protected areas when working with climate change adaptation.

For more detailed information about each adaptation methodology, have a look at the corresponding reports/websites listed under References (page 62).

Old growth forest,
Øvre Pasvik.
PHOTO: Tommi Nyman

The NPS methodology for Climate Change Adaptation Planning

This handbook focuses on scenario-based climate change adaptation, a process where scenario planning is incorporated into climate change adaptation to work with future climate uncertainty. This planning process has been developed by the US National Park Service (NPS) to aid protected area managers in adapting to climate change.

The methodology has been tested and developed by NPS for over a decade through their Climate Change Response Program (CCRP). CCRP has also developed supporting resources, such as training materials, tools and templates, reports, and online information on climate change science, adaptation, mitigation and communication.

The foundation for climate-smart adaptation in the NPS is described in the guidance *Planning for a Changing Climate: Climate-Smart Planning and Management in the National Park Service* (NPS, 2021). This chapter gives a brief overview of the methodology and approaches used by the NPS, drawing from NPS' guidance and support.

NPS staff in Rocky Mountain National Park, USA, talking about climate change adaptation in the park.
PHOTO: Anna Berhan

Fundamentals of NPS Adaptation Planning Process

The NPS adaptation planning process emphasizes the use of multiple plausible future scenarios (page 14) and a shift from traditional management focused on historical conditions (example in the box) to more flexible, forward-looking strategies. Scenarios help managers understand climate risks better, deal with uncertainty, think creatively about the future, and identify strategies that remain useful and realistic across different climate futures.

The fundamental principles of NPS planning processes are to:

- **Develop forward-looking goals** that consider future climatic conditions.
- **Consider more than one scenario** of the future when developing management strategies and actions.
- **Act with intentionality**; link actions to climate impacts. For example: More frequent monitoring and evaluation of changing conditions, as well as refining management strategies as needed.
- **Manage for change**, not just persistence. For example, focus on supporting ecological processes and transformation and planning for ongoing change, keeping important ecosystem function while allowing species composition to shift.
- **Reconsider existing management goals**, not just strategies and actions.

These last three principles further distinguish climate-informed planning and decisions from “business as usual”. Managers need to plan for potential future conditions that may be quite different from the past. Under such conditions of *continuous change,* managers will also need to examine the validity of underlying *management goals* against projected future conditions and identify robust strategies that would be effective irrespective of which conditions play out in the future.

In the CLAP project, the NPS methodology for climate change adaptation has been piloted in protected areas in Norway, Sweden and Finland. Training was provided to the managers involved. This was possible through cooperation with staff from the CCRP throughout the project. PHOTO: Anna Berhan

EXAMPLES OF TRADITIONAL MANAGEMENT PRACTICES

- Maintaining historical ecosystem states, species distributions and landscape characteristics.
- Assumptions that natural systems fluctuate within historically observed ranges.
- Infrequent management plan revisions, expecting that conditions will change slowly.
- Using standardized interventions (e.g., fire regimes, invasive species control, or infrastructure maintenance) based on historical effectiveness.

The NPS adaptation planning process includes six steps (Figure 8). These steps can be modified as needed to fit different scales, timeframes, and management goals.

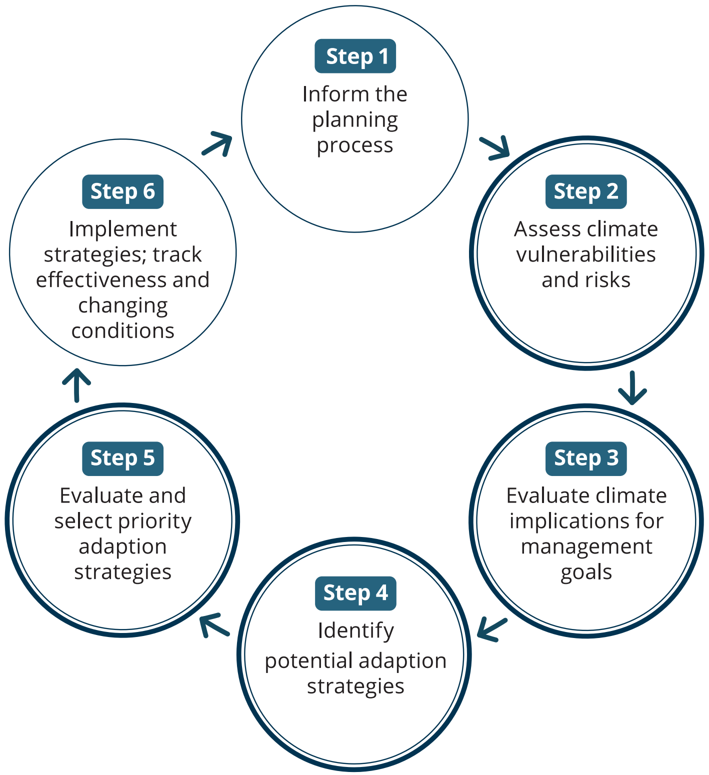


Figure 8. Generalized NPS adaptation planning process

The concentric circles of Steps 2 through 5 represent multiple scenarios for consideration (NPS, 2021).

Whether creating a new plan or updating an existing one, the fundamental components and sequencing of the NPS methodology are an effective way to address climate change, as well as other important drivers of change, in most planning processes. Adaptation is a continuing process - as reflected in the planning cycle - rather than an endpoint. The six planning steps are summarized in Figure 9, and described in more detail on the next page.

Figure 9. Summary of NPS Adaptation Planning Process

Step 1

Inform the planning process

- Define scope and current management goals.
- Engage participants and partners.
- Compile relevant background and context information.

Step 2

Assess climate vulnerabilities and risks

- Identify projected climate futures.
- Assess climate vulnerabilities and risks.

Step 3

Evaluate climate implications for management goals

- Assess continued feasibility of current goals.
- Consider creating new or updated climate-informed goals.

Step 4

Identify potential adaptation strategies

- Identify adaptation options to address climate risks.

Step 5

Evaluate and select priority adaptation strategies

- Evaluate and compare adaptation options.
- Select priority adaptation strategies.

Step 6

Implement strategies; track changing conditions and adaptation effectiveness

- Implement priority adaptation strategies.
- Evaluate the implementation and effectiveness of adaptation strategies and actions.
- Monitor conditions to assess how the future is emerging.

Document outcomes and adjust actions and plans as needed.

Step 1. Inform the planning process

Define the scope - which resource or asset (such as a species, trail, or building) are in focus and what is the geographical area and timeframe of concern. Clarify existing management goals – which may entail describing existing management practices, what they intend to achieve, and why. Engage participants and partners: bring together a small core team to guide the process. Engaging stakeholders and subject matter experts may be helpful. Map relevant stakeholders and connect with them. Compile relevant background and context information (such as the protected area's foundation document, data on the resources of concern, vulnerability assessments, legislation, zoning, permits etc.) and existing climate change information for your selected geographical area. Retrieve climate data, based on climate drivers relevant for the focal resources of interest, for selected historic, present and future time periods. If relevant future climate projections for your selected geographical area are not publicly available, you may have to order them (page 53).

Step 2. Assess climate vulnerabilities and risks

This phase of the adaptation planning cycle focuses on understanding and assessing the potential effects of climate change on the resources, assets, or values of interest.

This step also includes the creation and use of multiple scenarios. In short, a set of "Climate Futures" is first selected from the retrieved climate projections (page 53). Relevant climate change impacts, vulnerabilities and risks related to the focal resources and assets are then assessed considering these Climate Futures. The resulting scenarios are then built out by creating a narrative description of the Climate Futures plus their effects on park resources, assets, and values. In other words, this step results in a vulnerability assessment for focal resources/assets.

Step 3. Evaluate climate implications for management goals

Asses if current goals are still feasible considering the scenarios and assessments made in step 2. If needed, update goals to be climate-informed and better reflect the realities of future conditions. Updates may require modifications to the goals' descriptions of *what, why, where* and *when*. A list of resources regarding goal revision can be found under References on page 64.

Step 4. Identify possible adaptation strategies

Brainstorm and identify an array of strategies to address climate risks for the the focal resources or assets. The RAD framework (page 15) can be used to consider a range of options, including maintaining current conditions (resist), allowing change to unfold (accept), or guiding it in a particular direction (direct).

Step 5. Evaluate and select priority adaptation strategies

Evaluate and compare promising adaptation strategies based on criteria like feasibility, timing, cost, and expected benefits. Select priority strategies that best achieve the climate-informed goals and that work across multiple scenarios.

Step 6. Implement strategies; track changing conditions and adaptation effectiveness

Step 6 moves from planning to doing. First, implement priority adaptation strategies. Then, monitor changing conditions and evaluate the effectiveness of adaptation strategies and actions over time to ensure they provide the desired effect. Adaptation is an ongoing and iterative process, where these steps build on and draw from one another. Document outcome and adjust actions and plans as needed.

ⓘ For definitions of Climate drivers, Climate projections, Climate futures and Scenarios, see Glossary on page 66.

ILLUSTRATION: **NPS**

Figure 10. **Comparing single-forecast planning to scenario-based adaptation planning (NPS, 2021)**

Forecast planning (left) entails planning for one predicted future (typically within an acceptable margin of error) – which is most appropriate when there are aspects of the future that are controllable and considered likely. **Scenario planning** (right) considers multiple potential futures as plausible. Scenarios build on what is known but also consider the inherent unpredictability of complex systems.

The use of scenarios in adaptation planning

Scenario planning is a widely applicable approach to help organizations prepare for an uncertain future. It has been in use for over fifty years to explore multiple sources of future uncertainty. Scenarios are used as a platform to generate ideas for how best to cope with future challenges and opportunities (Figure 10).

In the NPS adaptation planning process, scenario planning is used to address uncertainty and identify adaptation options in both formal planning efforts and routine operations.

Scenario-based adaptation planning means that several plausible scenarios are created and considered when analysing vulnerabilities and risks in step 2 of the process. In step 3, managers will need to examine the validity of underlying management goals against projected future conditions. Scenarios are also used in step 4 and 5 to identify robust adaptation strategies that would be effective irrespective of which conditions play out in the future.

The Resist-Accept-Direct (RAD) Framework

In Step 4 of the planning process, it is recommended to use the RAD framework (Figure 11). RAD is a tool that helps managers explore a broad range of adaptation options. It emerged from work by NPS and partners on climate change adaptation and ecological transformation, especially in landscapes where returning to historical conditions is no longer possible (*Schuurman et al, 2020*). It is most useful for living resources but may also inform options for cultural resources, facilities, and visitor experience.

RAD is not a strict formula, but a way to structure thinking and discussions. It helps clarify the types of responses that are possible. For examples of RAD strategies, see *Planning for a Changing Climate: Climate-Smart Planning and Management in the National Park Service* (NPS, 2021).

Flooded trail in Reisa National Park. PHOTO: Nina Storm

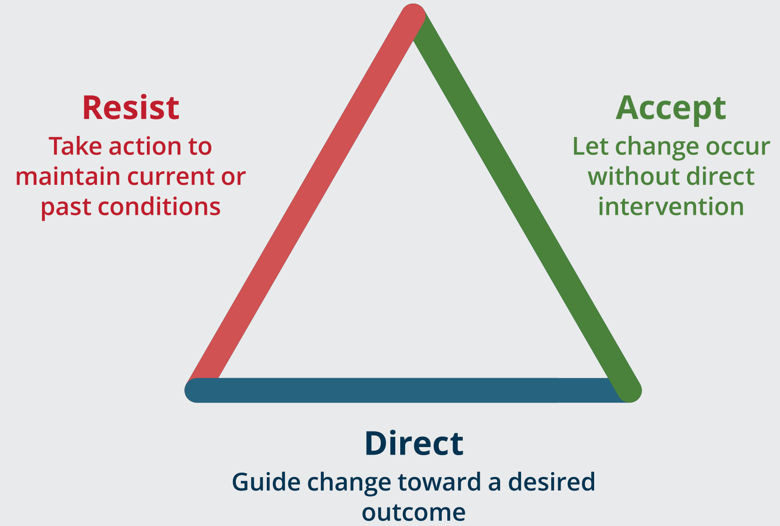


Figure 11. The RAD Framework: management response for ecosystem transformation

RAD helps managers think clearly about their options by organizing adaptation strategies into three types:

- **Resist** – Take action to maintain current or past conditions. This might involve stabilizing shorelines, fighting invasive species, or protecting existing vegetation or species.
- **Accept** – Let change occur without direct intervention. This may be appropriate when change is unavoidable, when the system is expected to adjust on its own or when resources are limited.
- **Direct** – Guide change toward a desired outcome. Examples include helping new species establish, managing transitions between ecosystems, or shifting infrastructure to new locations.

Definitions adapted from Schuurman et al. (2022); design adapted from Thompson et al. 2020.

Different types of planning approaches

When starting a scenario-based adaptation planning process for a protected area, it is helpful to reflect on your planning needs to determine which approach (process design) is most suitable. You may first consider **how broad the scope of issues is** and whether the goal is to **explore** options or to make a **decision.** The matrix on this page (Figure 12) highlights four main approaches that may be applied. These approaches have evolved from NPS experience of applying the planning process to many different ecosystems and organizational settings. The matrix and description in this section draw on experience generously shared by Wylie Carr, Planning Specialist at NPS CCRP (personal communication, 2025–2026).

These approaches are not rigid categories. Climate adaptation is not a one-size-fits-all process, but one that can and should be adapted to the specific challenges and opportunities of each site.

Important factors to consider that also affect the choice of approach may be staff capacity, project/funding timelines and the availability of and need for relevant climate projections for the selected geographical area (affects how quickly pilot parks are able to get started). Generally, the resources needed (time, money, number of participants, more detailed climate drivers and scenarios) increase for broader scopes and more decision-oriented approaches.

Which planning approach is most suitable for a park or reserve may also evolve over time; in the beginning exploratory planning efforts may be more suited to the needs, later going into more decision-focused processes that support strategy development, goal setting, and implementation.

In all approaches (but least in the lower left), it is helpful for a planning team to get assistance from someone experienced with the adaptation planning process and tools, especially when applying them for the first time. Look for an adaptation specialist within your own or a neighboring organization, or from a consultant agency. A planning team, park staff and subject matter experts are often needed in all approaches, to varying extents.

Reading case studies of how different planning approaches were carried out can be helpful when choosing and designing an approach. See the list of resources for examples (page 64).

Figure 12. Main types of scenario-based adaptation planning approaches applied by the NPS

	EXPLORATION ORIENTED To inform future plan/decision	**DECISION ORIENTED** To inform near-term plan/decision
BROAD SCOPE Many issues or resources	**BROAD EXPLORATIONS** Scenarios used to assess impacts on a wide range of park resources and explore adaptation options for future planning/decisions.	**BROAD DECISIONS** Scenarios used to assess impacts on a wide range of park resources and generate adaptation options and actions for active planning/decisions.
NARROW SCOPE One or two issues or resources	**NARROW EXPLORATIONS** Scenarios used to assess impacts on a specific park resource and explore adaptation options for future planning/decisions.	**NARROW DECISIONS** Scenarios used to assess impacts on a specific park resource and generate adaptation options and actions for active planning/decisions.

Below is a description of when each approach is suitable, along with examples of recommended processes.

BROAD EXPLORATIONS

This approach informs the conversation around climate change adaptation for a whole national park or reserve. It identifies vulnerabilities for a wide range of resources and often results in several adaptation options that can be considered in future decisions or plans. It encourages cross-team collaboration, highlights new data needs, and provides a framework for communication/engagement.

Recommended process: Facilitated Exploration Workshop

- 2-day workshop (process duration 4-12 months).
- Output: Workshop summary report with potential management options.

BROAD DECISIONS

This approach is suitable when there is a need to make decisions about a wide range of resources, and there is a need for a holistic and inclusive process to help identify issues and feasible solutions (e.g., revising a general management plan). It requires significant preparation and an extensive use of subject matter experts to assess vulnerability and identify adaptation options for specific resources. This approach is the most demanding, but also the most integrative and impactful one, as it leads to decisions and actions across multiple resources and possibly refined management goals. It also builds long-term scenario planning expertise.

Recommended process: Multi-resource Decision Support

- Series of meetings (process duration 6-18 months).
- Output: Spreadsheets/report with resource-specific vulnerability assessments and prioritized adaptation actions.

NARROW EXPLORATIONS

This approach can be used to inform the conversation around climate change adaptation focusing on one or a few specific resources/issues (e.g., a species or a trail). The process can be completed efficiently by a small team and can inform both formal plans and day-to-day decisions. It can be an entry point for raising awareness on climate adaptation and preparing staff for a more decision-oriented process in the future. It may also serve as a baseline for re-visiting the process for other resources as necessary.

Recommended process: Completing worksheets on step 1-6*

- One 4-6 hours session or a series of sessions (during 3-12 months.)
- Output: Completed worksheets identifying priority adaptation actions.

*Worksheets can be found in the *Self-guided Workbook for Scenario-based Climate Adaptation*, NPS, 2025 (see list of Resources, page 64).

NARROW DECISIONS

This approach informs a decision about a specific resource or issue and how it might perform under different scenarios. Best used when a management choice is upcoming and climate risk is a concern (e.g. major investment decisions that account for climate change, such as where to relocate a visitor centre). It requires more detailed information, technical input and climate knowledge. The approach results in a priority action and provides a clear justification framework.

Recommended process: In-depth analysis / modelling

- Series of meetings (process duration 3-6 months)
- Output: Technical report detailing climate impacts on specific resource/asset.

Involving stakeholders

All approaches can involve external stakeholders, and often work better when they do, but it isn't required. Engaging multiple stakeholders can lead to a more complete process by adding new perspectives or concerns, and it can also strengthen collaboration. Determining whether and how to involve external stakeholders is often up to the planning team. Involving external stakeholders will affect the design, facilitation, and timeline for the process.

It is important to articulate very clearly *who* will be involved, *why* (what is the desired outcome from their involvement), *when* (during which parts of the process), and *how*. This is especially true when attempting to engage with either a broad group of subject matter experts (as in the Broad Decisions approach) or indigenous partners.

Inhabitants of Abisko village during a climate walk in Abisko National Park. PHOTO: Anna Berhan

Pasvik Nature Reserve along the Pasvik river.
PHOTO: Rolf Sch. Kollstrøm

Piloting Adaptation Planning

Introduction

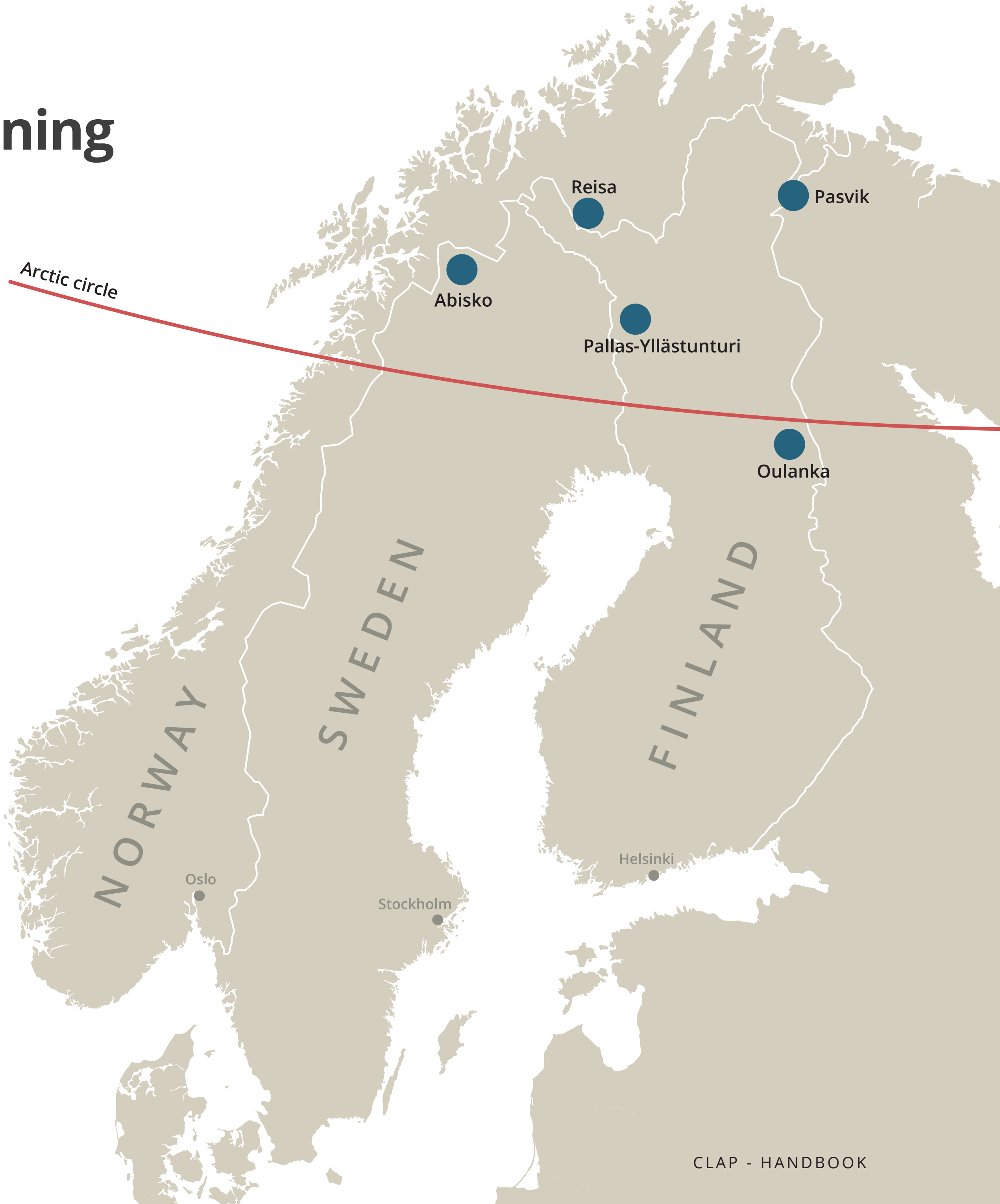
The Arctic region is warming rapidly and the effects on nature are growing. The CLAP project began because managers of protected areas needed a better understanding of what these changes could mean and new ways to plan for and deal with the changes.

As part of the CLAP project, the scenario-based adaptation planning methodology developed by NPS has been piloted in five protected areas:

- Abisko National Park in Sweden,
- Reisa National Park and Pasvik Nature Reserve in Norway,
- Oulanka and Pallas-Yllästunturi National Parks in Finland.

The purpose of the pilots was to build capacity in climate change adaptation and to test how the NPS methodology could fit into each country's existing planning processes.

The pilots demonstrate how protected areas can plan for an uncertain future by systematically integrating scenario-based climate change considerations into management processes. Furthermore, these pilots offer a range of replicable approaches for addressing the pressing challenges of climate change in nature conservation. Since these protected areas are all located in the Arctic region and share many conditions and management challenges - for example related to climate change, land use change, nature types, fauna, culture and demography – the pilots also provide useful learnings related to the region. The pilot processes also highlight the value of cooperation, stakeholder engagement, and learning-by-doing. The general lessons learned from the five different planning processes are described in Chapter 4 Advice for planners.



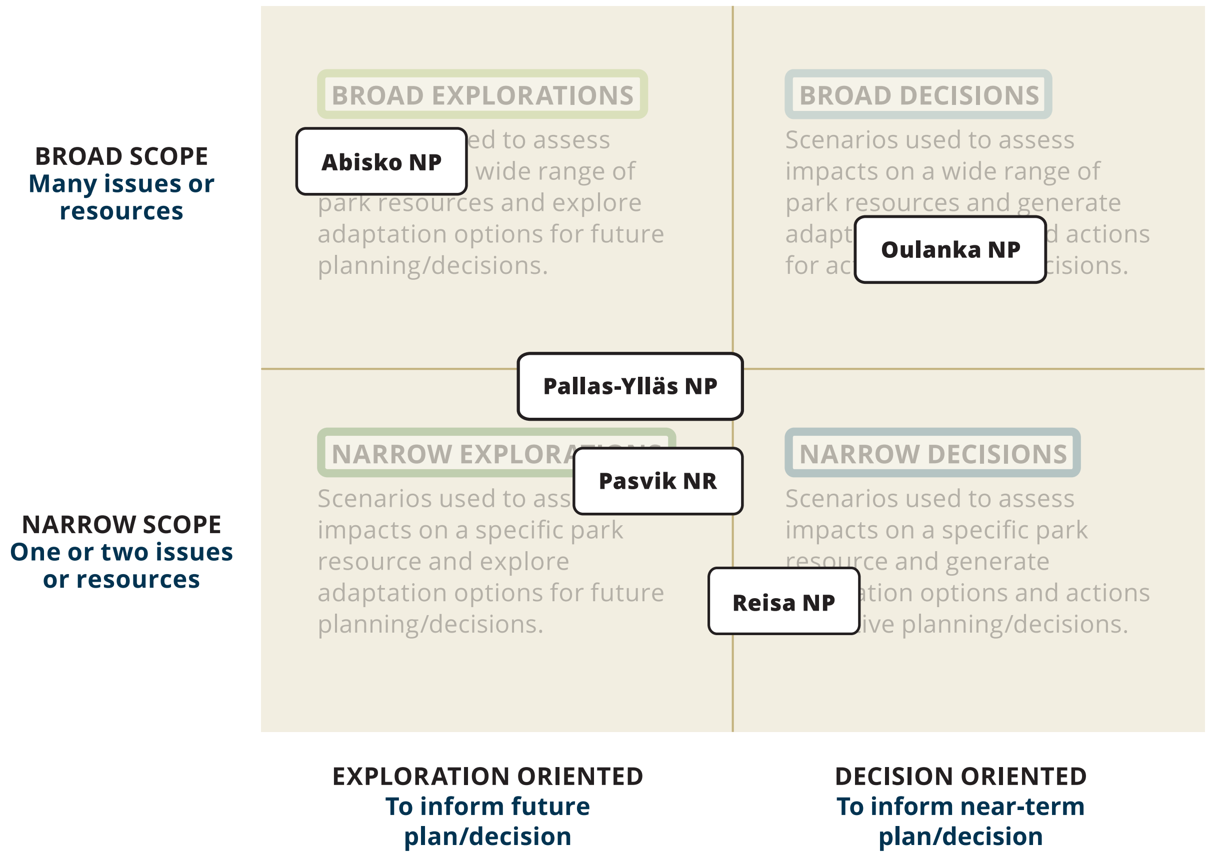
Each pilot followed the six steps of NPS adaptation planning cycle (page 12). Before starting up the pilots, all five planning teams participated in the training course *Planning for a Changing Climate* (page 57). They also took part in a series of pilot planning meetings where a planning specialist from the NPS supported the implementation of the method.

Each pilot is described on the following pages. They all represent different planning approaches (planning process designs) depending on:

- **how broad the scope of issues was**, and
- **the desired outcome** of the planning effort - whether the goal was to explore issues or to make a decision.

All five pilot planning efforts aimed at providing input for future park planning documents. However, they differed in approach depending on whether the process was in an early exploratory stage or more closely tied to formal decisions. To illustrate which approach it resembles the most, the five pilots are placed in the NPS matrix (Figure 13), describing four main types of planning approaches.

Figure 13. Planning approaches piloted in the CLAP project



Adaptation planning pilot in Abisko National Park

FOCAL QUESTION:

"How might climate change, together with other factors, shape the future of Abisko National Park over the next 25 years, into 2050?"

Abisko National Park, established in 1909, spans 77 km² and features a mountain valley surrounded by fells, with mountain birch forests, streams, and a rich biodiversity of flora and fauna. The area has a deep cultural significance, being a reindeer herding area for the Sámi community. The park attracts around 150,000 visitors annually for hiking, skiing, and northern lights tourism.

The park was chosen as a pilot area because it is situated in the Arctic-Subarctic region with habitats and species vulnerable to climate change. The park also has many visitors all year round and it has several trails and other facilities.

The overall purpose of the pilot was to start a conversation about climate change adaptation for a broad set of resources in the park and to generate ideas for a future update of the park's management plan. Hence, the planning effort had a broad scope and exploratory approach.

The pilot took 9 months, and the planning team consisted of one team leader and five participants. A summary of the planning process design is illustrated in Figure 15 (page 26).

Abiskoeatnu river and the King's Trail in Abisko National Park.
PHOTO: Jan-Erik Nilsson

The pilot planning process - a broad scope exploratory approach

Step 1. Inform the planning process

Defining the scope and current management goals

The planning team first decided to focus on three common nature types, the well-used King's trail and the visitor experience in the park. To welcome a broader discussion with stakeholders, the scope of issues was later widened to three general focus areas: natural resources, facilities and visitor use.

The **time frame** was set at 25 years, due to the expected lifespan of many facilities and the reasonable duration of a new management plan. Also, a longer planning period can be hard to grasp. The **geographic scope** was limited to the park area, as management responsibility only extends there. However, it was acknowledged that resources may be affected by events outside park boundaries. Based on the geographic scope and time frame, **the focal question** of the planning effort was expressed (page 22) and used when communicating the focus with participants.

Background information collection

Conservation and **management goals were retrieved** from several documents. One was the management plan from 1992, which is based on the purpose of the protection from 1909: the park "shall be cared for and managed to preserve the high-Nordic mountain landscape in its natural state". The park is also part of the EU's Natura 2000 network and has a conservation plan with goals for Natura 2000-related habitats and species. Objectives for trails and facilities can be found in national guidelines. Existing management goals were complemented by oral information from park staff on yearly management tasks. Existing literature on climate impacts on the region and resources of concern was also reviewed.

Climate data

To acquire relevant **climate projections** downscaled for Abisko National Park, the planning team ordered a climate analysis report from the Swedish Meteorological and Hydrological Institute (SMHI). Since the scope of the planning effort was broad, the climate drivers included (such as temperature, precipitation, length of vegetation period and zero crossings) were mostly general. Two projections were selected as plausible climate futures to be used in the planning process; one assuming low emissions of greenhouse gases (RCP 4.5) and one assuming high emissions (RCP 8.5). To create more divergence (page 55), the first climate future was based on a near-future time frame 2011–2040 and the second on a mid-future time frame 2041–2070.

Engaging participants and partners

A wide range of stakeholders and experts were invited to the two external workshops with the aim of exploring the focal question. Invitations were sent to the municipality, tourism operators, Sami village representatives, external natural resource experts, and internal specialists.

Step 2. Assess climate vulnerabilities and risks

Step 2 was carried out over three exploratory workshops, two shorter of two hours each and one main two-day workshop.

Drivers of change

The **first workshop** was held during the Abisko National Park Council's annual meeting, with participants from the council, the planning group and park managers, as well as some additional internal managers. In this workshop, historic climate data and the two climate futures for Abisko National Park were presented. Participants then worked in small groups to describe changes already happening (which is relatively easy and serves as a good "warm up" to engage participants) and to **identify potential future drivers of change** (climatic and non-climatic) likely to affect the park.

Based on the list of potential drivers of change, **a scenario framework was created** by the planning team in a **second internal workshop**. The scenario framework was created by:

1. having a complementary brainstorming exercise to list more drivers of change
2. sorting all the identified drivers of change into the three categories: **pre-determined**, **critical uncertainties** and **wildcards**
3. choosing two critical uncertainties to use (as axes) in the scenario framework.

The two chosen critical uncertainties "Climate change" and "Number of visitors" were then placed on the axis to create the resulting scenario framework (Figure 14).

Assessments and scenarios

The **third and main exploratory workshop** was two days and had the objectives of developing an understanding of how to integrate climate change considerations into the management of Abisko National Park and to generate adaptation options for consideration in a future update of the park's Management Plan. External stakeholders, the planning team and park staff participated. In order to prepare the 20 participants, a 1.5-hour pre-webinar was held online providing background information about the climate analysis for Abisko, the methodology and the CLAP project. Background information was also provided about the three focus areas (natural resources, facilities, and visitor use), including some of their known climate vulnerabilities and related management challenges. Here is a short description of step 2 as completed in the main workshop:

Participants worked in mixed-expertise groups to develop the four scenarios in the framework. The groups discussed potential conditions, events, and effects and placed them along a timeline for the years 2025-2050. Each group was also provided with a "pre-determined event" (or "wild card") - an additional way to create divergence and to stretch participants' thinking. The groups then listed possible challenges and opportunities related to the scenarios.

After assessments, each group created a scenario narrative (short texts with memorable titles) describing what the park might look like in 2050 (example in Figure 14). The groups chose how to present their narrative for the whole group, for example with future "news headlines" or by performing a future conversation about the state of things.

Step 3. Evaluate climate implications for management goals

The park's main management goals were discussed in groups divided by focus area expertise. The task was to **assess the continued feasibility of current goals**, i.e. if they are achievable considering climate change and the potential future scenarios created. The intent was mainly to raise

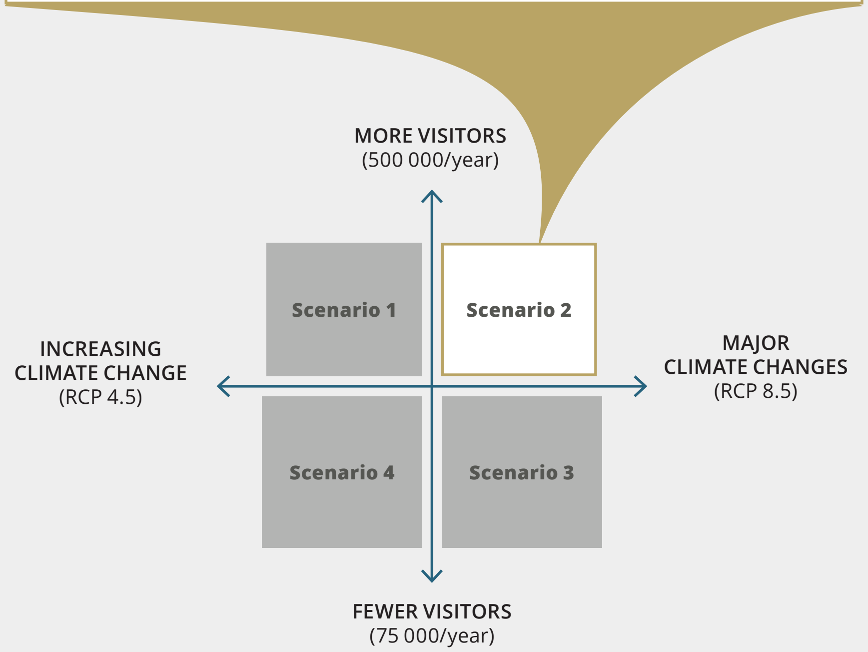
Figure 14. Scenario framework and example of a narrative

The scenario framework that was created and used in the planning process with an example of a scenario narrative (for Scenario 2 "Hot and crowded").

Example of a narrative scenario description

Scenario name: Hot and crowded. In this scenario, visitor numbers double and the climate becomes hotter and wetter. A warmer climate and longer growing season change alpine ecosystems: permafrost and permanent snowfields disappear, and alpine heaths and grasslands become bushier. Arctic species face local extinction.

The snow season is two months shorter, closing winter trails due to inadequate snow and ice. More visitors combined with heavy rain cause severe erosion, trail damage, and unsafe conditions from flooding and slippery ground. High river flows collapse bridges. Campsites become overcrowded, leading to illegal camping. Summer droughts cause water contamination and visitor-caused wildfires.



awareness and examine the relevance of existing goals before going into step 4-5, and to provide input for the later revision of the formal management plan. The intent was not to include goal revision (which can be part of step 3), as this is generally more suitable for a group with more insight into the park management and a closer tie to its decisions. Even assessing existing goals proved to be somewhat hard for the participants not working with the park, since the goals were very general. When park staff explained and gave their input, it was easier for other participants to understand and discuss the goals.

Step 4. Identify potential adaptation strategies

This step was also conducted during the two-day workshop. The session started with a recorded presentation by NPS of the RAD framework (page 15), which was a helpful preparation. Participants were then asked to brainstorm and **identify adaptation actions to address climate change and the management challenges** under each scenario. Brainstorming started individually and was then conducted in small groups.

Step 5. Evaluate and Select Priority Adaptation Strategies

In this step, workshop participants **evaluated and prioritized the adaptation actions** according to their effectiveness and feasibility and ranked them by their score. The groups did not manage to assess all actions in the given time, stressing the need to use a clear and effective assessment method. The session ended with large group presentations and valuable discussions on, for example, which actions are robust across scenarios or may be applicable for "worst-case" events, and which conflict or are win-win – as a help to **clarify priorities**.

Output and next steps

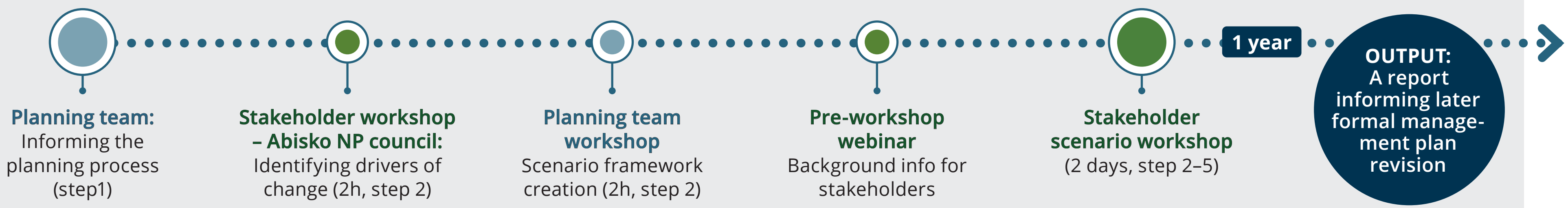
The planning process is documented in *Climate Change Adaptation Planning - A Pilot in Abisko National Park 2024–2025*. The report contains information on the workshop methodology, the results and the lessons learned. The documented results intend to inform both near-term management actions in Abisko National Park, and the later formal process of updating the management plan.

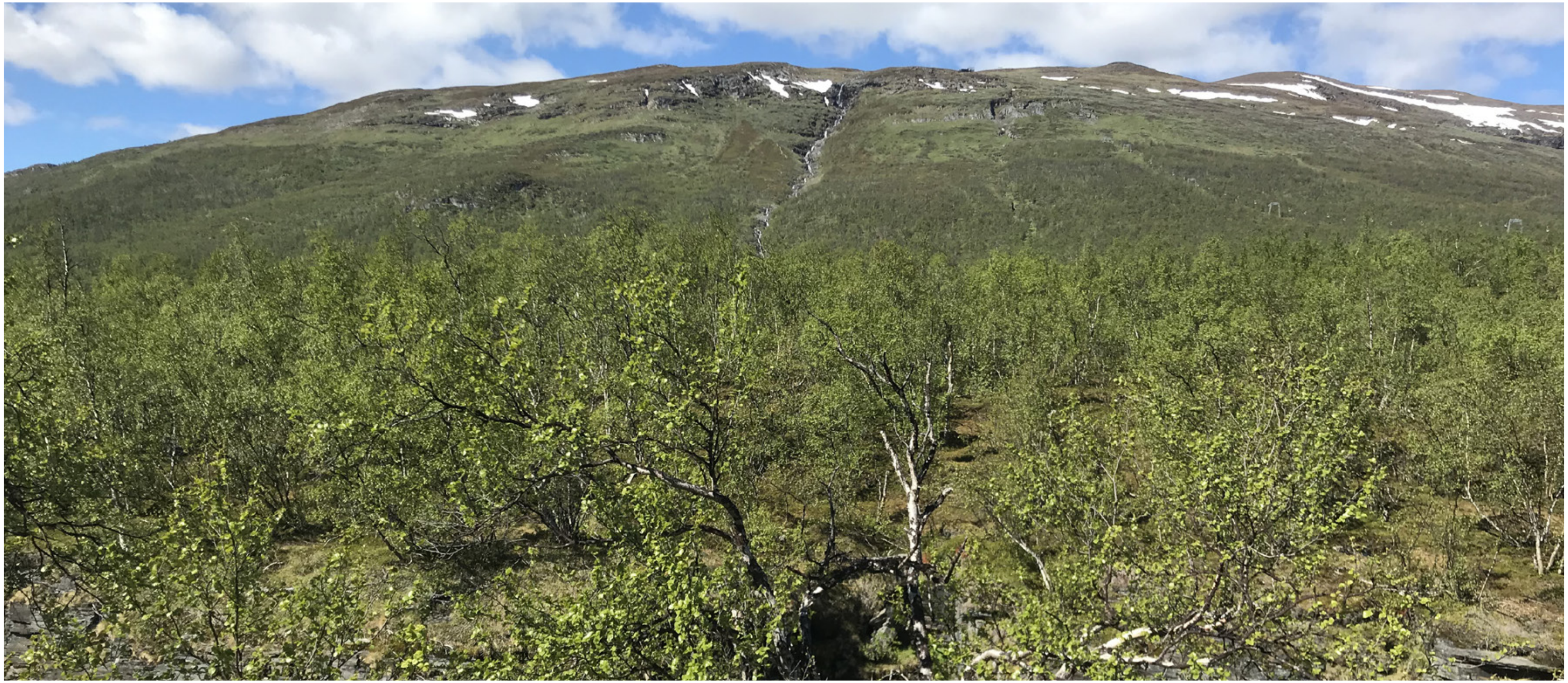
In September 2025, a public Climate Workshop was held in Abisko, generating additional assessments of climate impacts and more suggested adaptation actions.
PHOTO: Anna Berhan

A FINAL REFLECTION:

In an exploratory planning approach it can be frustrating to only "scratch the surface" (for example not going in-depth in resource-specific analyses). At the same time, it was a good way to introduce climate-related discussions and to bring out some well-thought-out adaptation options, based on existing knowledge. An exploratory approach can also give valuable input to further planning. Questions and issues that can not be answered during workshops can be collected for future work.

Figure 15. Planning process design - a broad and exploratory approach





The fell Njullá in Abisko National Park. PHOTO: Anna Berhan

Adaptation planning pilot in Pallas-Yllästunturi National Park

FOCAL QUESTION:
"How will climate change affect timing of visitation, scenery, trails and buildings in Pallas-Yllästunturi National Park in 2050?"

Pallas-Yllästunturi National Park is the most visited national park in Finland, receiving roughly 600 000 visits per year. The grandeur of the pristine fells was recognized as early as 1938, but the national park reached its current size of 1023 km^2 in 2005.

The landscape is dominated by the 100 km-long area of fells. The surrounding aapa mires and sheltering moist forests offer a habitat for old growth forest mosses, lichens and fungi.

The Pallas-Yllästunturi region is a popular tourist resort with 300 kilometers of cross-country ski tracks and hiking trails within the national park, which are also used for mountain biking and snowshoeing. There are four ski resorts, thousands of accommodation beds, several villages, a night train station and an International Airport in proximity to the national park.

The purpose of the pilot was to develop a new **Climate-Smart Nature Tourism Plan**. The previous Nature Tourism Plan was from 2019. For the Climate Smart pilot version, the NPS planning process was adjusted to suit organizational needs. The goal of a Nature Tourism Plan is to ensure sustainable land use of a protected area in cooperation with stakeholders. Now, for the first time, climate change is featured as an overarching theme. The pilot has also given room to rethink the whole planning process, content, stakeholder engagement, and graphic design. The planning team consisted of three managers from Metsähallitus and the pilot process lasted about 10 months. A summary of the planning process design is illustrated in Figure 16 (page 31).

Open day trip huts at Pallas-Yllästunturi National Park serve year round.
PHOTO: Metsähallitus

The pilot planning process - a narrow-scope exploratory approach

Step 1. Inform the planning process

Background information collection

To start with, the planning team looked into the previous Pallas-Yllästunturi Sustainable Tourism Plan (2019) and other recent protected area nature tourism plans, the Pallas-Yllästunturi National Park Visitor Survey (2021), the Principles of Management Planning for Protected Areas (2025) and the data from the ongoing Management Planning process of Pallas-Yllästunturi National Park. The future role of the nature tourism plan was also discussed, and its relationship with the general management planning process at Metsähallitus.

Defining the scope and current management goals

Trails and buildings, scenery and *timing of visitation* were defined as the focal resources to concentrate on, as they are all key components of nature tourism in the protected area. Focal questions were also defined for the pilot and the different workshops.

Climate data

The planning team identified that climate drivers related to *maintenance of trails and buildings, scenery* and *timing of visitation* were necessary to analyze the future of nature tourism within the area. For example, drivers such as *the start of thermic winter* and *the start date of deep snow cover* were selected to indicate when small bodies of water freeze, and when there is enough snow for the activity season in tourism to start in full. A more typical driver, *time of the first snow fall,* was not selected, as it does not provide much information for tourism business.

The preliminary list of different climate drivers and their impact on focal resources was assessed on a scale from low-moderate-high (1-3), for example *If the deep snow cover arrives later, is the impact on timing of visitation low, moderate or high?* The final list of drivers (9) with the highest total score was considered as most relevant covering all focal resources and were used for ordering climate futures.

Visitor Centres and information boards help visitors to navigate within the park.
PHOTO: Metsähallitus.

It was challenging to assess what kind of changes in weather are critical and how severe their impact on nature tourism is. What helped was *what-if - discussions.* For example, what if the first snow fall takes place in January, what if the treeline reaches the top of the fells?

The report called Climate Futures of Northern Nature Reserves by Finnish Meteorological Institute, 2025, provided two divergent climate futures for Pallas-Yllästunturi National Park. The two climate futures for 2041-2070 and 2071-2100 include the selected climate drivers and represent two plausible outcomes of a wider set of climate models.

Engaging participants and partners

To cover steps 2-5, the planning team organized three 2-hour online workshops for 10 different internal specialists. Another set of three 2-hour online workshops was organized for stakeholders, a group of 130 tourism business operators from the region, of whom 30 participated.

The workshop participants were provided with pre-reading materials and tasks on the *Howspace online platform.* Participants also had a opportunity to revisit the assignments and recordings from previous workshops, to comment and give feedback.

Step 2. Assess climate vulnerabilities and risks

In the first workshop, nature tourism scenarios for 2050 were created, one for snowless season and one for snowy season. *Climate futures 1 and 2* were placed on the x-axis and *sustainable use of the protected area* on the y-axis. The sustainable use of the protected area was then assessed considering the two climate futures, resulting in eight narrative scenario descriptions of future tourism in the area. These descriptions represent alternative scenarios but are not forecasts.

The focal resources for the pilot were selected before the workshops started. In the process of planning the workshops, the planning team realized that the common denominator for both stakeholders and Metsähallitus was *nature tourism as a business* - for stakeholders as a business environment and for Metsähallitus as the landowner.

Kesänkijärvi lean-to-shelter at Pallas-Yllästunturi National Park. PHOTO: Metsähallitus

Trails and buildings, scenery and time of visitation are an essential part of nature tourism, but managed only by Metsähallitus within the protected area, whereas *nature tourism* is relevant for both.

Step 3. Evaluate climate implications for management goals

The goal of a Nature Tourism Plan, to e*nsure sustainable land use of a protected area in cooperation with stakeholders*, is dictated by the Principles of Management Planning (2025) and was not revised in the tourism plan process. Thus, Step 3, to assess the feasibility of and revise current goals, was not covered the way the NPS process suggests. Instead, in the second stakeholder workshop the participants wrote down suggestions on what they would like nature tourism to look like in 2050, if climate future 1 or 2 would materialize. In the process of writing, the participants asked themselves:

> ***What kind of nature tourism do we welcome in the area? What kinds of impacts from the changing environment (in general, not just climate) do we need to resist, to accept or try to direct so that nature tourism would be what we want it to look like in 2050?***

Nature tourism is an entire industry and applying the RAD framework for an industry instead of a more narrowly defined focal resource was challenging. The tourism industry can be looked at from so many different angles. For future reference, pre-defining the most important common denominators (between stakeholders and Metsähallitus) for nature tourism in the national park and formulating those as resources for RAD framework would be useful. Participation in the workshop required the stakeholders to adopt new concepts within a short time frame, which did not make the assignment any easier.

After the workshop, the planning team used AI to process the results (in the form of comments) to create narrative texts. The planning team also revised the AI result to make sure it was the best possible reflection of the comments and the discussions. The result was a desired future state of nature tourism in 2050.

Step 4. Identify potential adaptation strategies

The last workshop with the stakeholders was about identifying potential adaptation strategies. The question was:

> ***What climate impacts do we need to resist, accept or direct, for the desired future state of nature tourism to materialize?***

As a result, the planning team got a reasonable list of adaptation actions categorized under resisting, accepting and directing. However, since the actions in the nature tourism plan are not binding for the stakeholders, the planning team formulated the actions into a climate change adaptation plan, with recommended actions for different operators, including Metsähallitus. All the listed actions take tourism in the area, and the national park management, towards a more climate-adopted state and closer to the desired future state of nature tourism.

Step 5. Evaluate and Select Priority Adaptation Strategies

The planning team processed the results from the last workshop with AI, enriched it with their own thinking and compared it to the list of actions (a draft) from the ongoing Pallas-Yllästunturi Management Plan revision process. The end result is a climate change adaptation plan, within the Pallas-Yllästunturi National Park Climate Smart Nature Tourism, plan directed to both stakeholders and Metsähallitus.

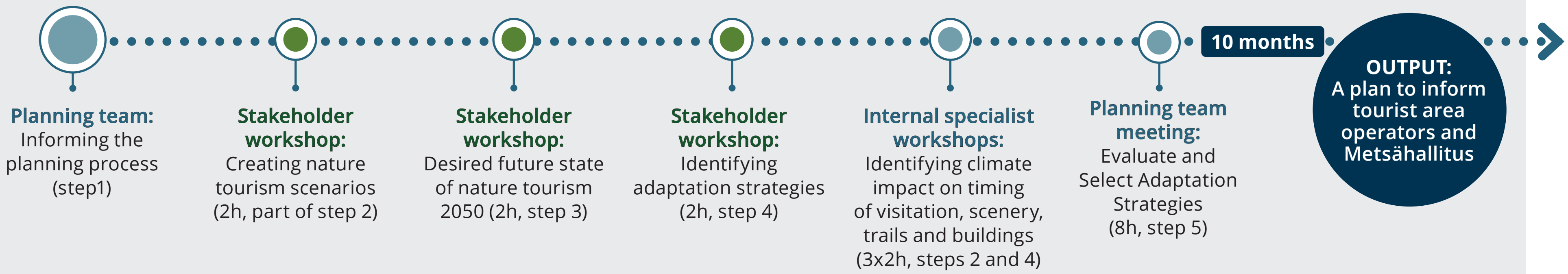
Outputs and next steps

The Climate Smart Nature Tourism Plan for Pallas-Yllästunturi National Park is compiled into a document (pdf) that is available in the public Metsähallitus Publication Database, in Finnish. It will be shared for all stakeholders and for all new Pallas-Yllästunturi National Park partner businesses (that will use the protected area for business purposes).

Pallas-Yllästunturi National Park is on the southern limit of Ptarmigan (*lagopus muta*) range. PHOTO: Metsähallitus

Mountain biking has become popular in the Pallas-Yllästunturi National Park. PHOTO: Metsähallitus

Figure 16. Planning process design - a narrow scope exploratory approach



Skier on top of Kukastunturi fell in Pallas-Yllästunturi National Park. PHOTO: Metsähallitus

Adaptation planning pilot in Reisa National Park

FOCAL QUESTION:
"How can Reisa National Park use climate projections to develop goals and actions that improve resilience and prepare for future climate challenges?"

Established in 1986, Reisa National Park covers 803 km² and is centered around the Reisaelva River, which flows through a dramatic valley characterized by cascading tributaries, waterfalls, and rich biodiversity. The area holds deep cultural significance and has long been used by people of Norwegian, Sámi, and Kven heritage. Today, it remains an important reindeer herding area for the Sámi community and attracts approximately 4,000 visitors annually for hiking, fishing, hunting, and other outdoor activities.

The purpose of Reisa National Park, as stated in its protection policy, is to preserve a beautiful and largely untouched mountain and valley landscape with its plant and animal life and geological features, while providing the public with opportunities for outdoor recreation.

Climate change has not previously been included in management plans, and actions have mostly been reactive rather than proactive. This planning effort seeks to shift from maintaining the status quo to establishing climate-informed goals and linking them to actions that address identified risks, using future climate projections to anticipate and prepare for impacts.

The pilot began in May 2024 and was completed in 2026, including a learning phase to understand and refine the methodology for use in Reisa. The planning team consisted of two team leaders: the managers of Reisa National Park. A summary of the planning process design is illustrated in Figure 17 (page 37).

Reisa National Park.
PHOTO: Petr Pavlicek

The pilot planning process - a narrow scope decision-oriented approach

Step 1. Inform the planning process

Scope and current management goals

The **geographical scope** was narrowed down to a section of the park: the valley between Sieimma and Nedrefoss, which is also the area with the highest concentration of visitor activity in the national park.

Based on background information gathered, the planning team made a list of **important resources** in the park that could be affected by a changing climate. The selection of key resources for this planning effort was based on which resources are likely to be affected by climate change, and which fall within the scope of management influence. In addition, the chosen resources had to be clearly linked to the protection policy and management goals for Reisa National Park. **Five key resources** were selected for the planning effort to make the process manageable (Table 3).

Background information collection

Background information and existing management goals for the national park were collected and explored by the planning team (retrieved from the Emerald network, The Natural Diversity Act, Available climate future data, the conservation purpose/policy for Reisa National Park and the management plan for Reisa National Park).

Climate data

To acquire **climate projections** and down-scaled climate data for Reisa National Park, a climate analysis was ordered from Nansen Environmental and Remote Sensing Center (NERSC). The planning team worked together with NERSC to identify which climate drivers could affect the various resources. NERSC then produced (modelled) climate projections (one example in Table 4, page 35). From the analysis, three climate futures were chosen for the planning effort based on low emission (green), mid emission (yellow), and high emission (red).

Table 3. Overview of key resources for the planning effort, their potential climate impacts, and the corresponding management goals

Key resource	Possible climate effect	Management Goals
Pine forests	Pine forests may face an increased risk of wildfires in the future due to changing climate conditions.	Maintain the presence of threatened and vulnerable species. Maintain the value of known areas with valuable habitat types.
Atlantic salmon	Higher water temperatures and lower water levels may increase stress on Atlantic salmon, affecting survival, reproduction, and overall health	Maintain populations of threatened and vulnerable species. Maintain important known wildlife areas as functional habitats for fauna.
River trail	Increased frequency and intensity of floods caused by spring snowmelt and rain-on-snow events may flood the main trail along the river, reducing accessibility and safety.	The management authority shall facilitate public access to outdoor recreation in those parts of the areas where this is appropriate. Outdoor recreation should contribute positively to quality of life, health, and well-being, and serve as a basis for local business development.
River summer access	Lower summer water levels may reduce the reliability and feasibility of river boat use, leading to increased difficulties in navigation and access	
River winter access	Warmer winters may cause unreliable ice conditions, raising risks and requiring alternative transport solutions.	

Ski trip with dogs to Jiertá waterfall. PHOTO: Nina Storm

The climate analysis included three timeframes: near–future (2024–2050), mid-range (2051–2075), and far-future (2076–2100). For general management planning, shorter time frames are often more practical, while longer horizons are needed to capture broader trends. To balance these needs, the focus for the planning process was decided to be on a **mid-range time frame (2051–2075)**.

Engaging participants and partners

A core group of 5–10 participants was assembled - a broad and diverse group of stakeholders who could contribute valuable knowledge to the process in Reisa and benefit from learning through participation.

Step 2-5. Core group workshops

The planning team organized and led **five workshop meetings** with the core group working through step 2–5 for one resource at a time. This approach allowed us to refine the methodology as we progressed. The process described here represents the final and most effective approach.

In the first session, the core group was introduced to the process. In each subsequent workshop, the group was guided through Steps 2–5 for one resource at a time. The results are compiled in *Climate Change Adaptation Planning in Reisa National Park 2024–2026* (References, page 62). Each meeting was scheduled for approximately two hours, which proved insufficient to explore a resource in depth. We would recommend 4–5 hours per resource.

Step 2. Assess climate vulnerabilities and risks

1. Each meeting began with a presentation of the three climate projections – green, yellow, and red – and the climate drivers relevant to the resource under discussion. A standardized template was used to illustrate the differences between the three projections (Table 4).
2. The group then discussed how these climate projections could affect the resource being examined in that session. Depending on the projected climate trends for each resource, the core group either focused on the mid-emission scenario (when the trends were similar across all projections) or on two contrasting scenarios (divided in two subgroups looking at one scenario each). Participants were asked to write down their thoughts and suggestions about the potential consequences of that scenario for the selected resource.
3. The group then shared their ideas, which were discussed collectively. All suggestions were listed under the relevant climate projection, to form climate resource futures.
4. Next, all climate futures were compared to identify any major differences in the potential consequences already discussed.
5. The facilitator then used AI tools to help draft suitable descriptions and narratives for different climate scenarios, based on the group's feedback and focus.

Table 4. Climate projections – River Trail and Flood Risk

The table summarizes projected mid-century (2051–2075) climate conditions for the river-trail resource and key climate drivers of trail flooding. It presents historical values and projected changes relative to these for RCP2.6 (green), RCP4.6 (yellow), and RCP8.5 (red). Data is compiled from the web application developed by NERSC (References, page 62).

MOST RELEVANT CLIMATE DRIVERS	Historical climate (1970–1990)	CLIMATE PROJECTIONS		
		Green RCP 2.6	Yellow RCP 4.6	Red RCP 8.5
Number of days with heavy precipitation (>10mm/day) in Spring.	1.8	0.2 11%	0.5 28%	0.9 50%
Number of days with extreme precipitation (>20mm/day) in Spring.	0.3	-0.2 67%	0 0%	0.2 67%
Water runoff in Spring [mm/day] % change.	1.75	0.37 21%	1.5 88%	1.95 148%
Number of days with Rain-on-snow events in Spring (more than 1 mm of rain on more than 5 cm of snow).	7	0.7 10%	7.7 110%	8.6 123%
Precipitation (Spring) [mm/day]	1.51	0.009 0.6%	0.18 12%	0.5 35%

Step 3. Evaluate climate implications for management goals

After step 2, **the feasibility of the current management goals** related to the specific resource was discussed. The task was to assess whether these goals are currently being achieved, how they might be influenced by the (climate-resource) scenarios created in step 2, and whether they remain attainable under those conditions. The purpose of this step was to evaluate existing goals and create new climate-informed goals. In Reisa National Park, most goals are very broad and lack specific detail. As a result, many goals could technically still be achieved under such scenarios.

New, climate-informed goals were drafted (example in the box) to be approved by the management board after the pilot and before moving into implementation in step 6. It was useful and felt important to make the goals more specific and climate-informed and to clarify their desired outcome, as well as to revisit and clarify the updated goals again after step 4.

Step 4. Identify potential adaptation strategies

In step 4, the core group either focused on one climate scenario at a time or worked to identify adaptation actions that could work across all scenarios. Participants were given time to brainstorm and record as many potential actions or strategies as possible, linked to the goals established in step 3. They were encouraged to think broadly and creatively, without limitations. The RAD framework (Resist, Accept, Direct) was used to explore a wide range of options. Since classifying strategies as Resist, Accept, or Direct was often challenging and time-consuming, this step was given less emphasis to avoid slowing down the process. In some cases, management goals from step 3 had to be revisited and refined to better align with the proposed actions and provide clearer guidance for future decisions.

After brainstorming, participants shared their proposed adaptation strategies, which were discussed in the group, aiming to identify at least one strategy for each RAD category. Finally, strategies were divided into short-term (green and yellow futures) and long-term (yellow and red futures). This prioritization helped clarify which actions should be implemented immediately and which could be deferred.

OVERARCHING, CURRENT MANAGEMENT GOAL	NEW CLIMATE-INFORMED GOAL
The management authority shall facilitate public access to outdoor recreation in those parts of the areas where this is appropriate. Outdoor recreation should contribute positively to quality of life, health, and well-being, and serve as a basis for local business development.	The management authority accepts short-term, natural events that temporarily reduce trail accessibility but does not accept permanent obstacles or closed routes. Measures should not be implemented to counteract short-term or extreme weather events such as floods or heavy rainfall; however, actions must be taken if trails become inaccessible over time – for example, due to fallen trees or erosion that removes the trail alignment.

Building more resilient bridges because of water eroding the riverbanks.
PHOTO: Asgeir Blixgård

Step 5. Evaluate and Select Priority Adaptation Strategies

Initially, we attempted to evaluate all proposed adaptation strategies together with the core group, but this proved too time-consuming. For the next resource, participants were given three votes to select the strategies they considered most important. Some strategies addressed the same issue and were grouped accordingly.

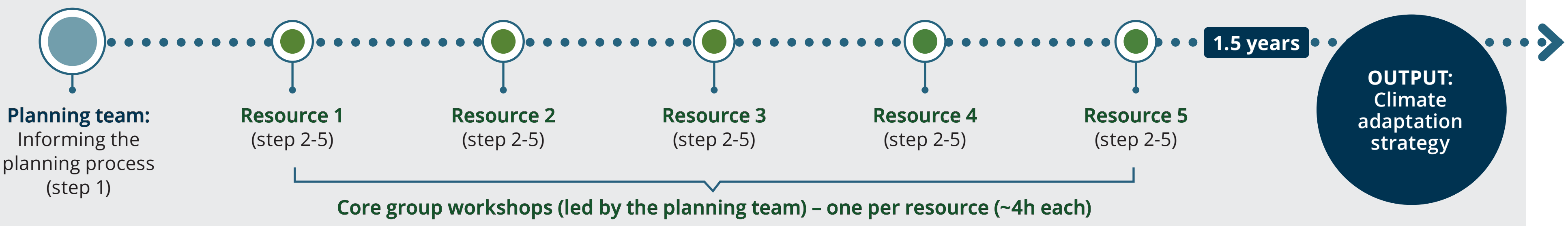
The prioritized strategies were then assessed by the planners, who assigned scores based on effectiveness and feasibility, providing justification for each rating. Strategies were ranked from highest to lowest score, and the top 3–5 were prioritized for implementation. This process allowed reflection on whether these strategies were realistic for the park to carry out.

Outputs and next steps

- **Climate Change Adaptation Planning in Reisa National Park 2024–2026** – A full report in English describing the piloted planning process, including detailed information on the resources, drafted goals and the lessons learned for this planning approach.
- **Kimatilpasningsplan for Reisa nasjonalpark** – A Norwegian strategy document to be approved by the National Park Board. This strategy will complement and guide the existing management plan by integrating climate considerations into both short- and long-term planning, and by outlining the implementation of actions and strategies.

A forget-me-not flower and a pollinator fly. PHOTO: Nina Storm

Figure 17. Planning process design - a narrow scope decision oriented approach



Adaptation planning pilot in Pasvik Nature Reserve

FOCAL QUESTION:
"How will nature, birdlife and Pasvik river be affected by climate change in the coming 25 to 50 years and how will these changes affect visitors and the visitor experience?"

Pasvik Nature Reserve was established in 1993 and covers 19 km². Until February 2022, there was active nature conservation cooperation with Russian environmental authorities in the joint Nature Reserve. The Nature Reserve is part of the Pasvik–Inari Transboundary Area cooperation and the European Green Belt.

The Pasvik valley is a northwestern extension of the Siberian taiga and is known for its great species diversity. The area marks the northwestern limit for several eastern plant and animal species that are otherwise rare in Norway. Pasvik Nature Reserve includes the longest and most intact remaining stretch of the Pasvik river's original watercourse. The *Fjærvann* area is central and important for wetland birds (IBA/ Important Bird Area), and the Nature Reserve is internationally recognized as particularly important for breeding, resting, and migrating wetland birds through the Ramsar Convention.

The main management objective for Pasvik Nature Reserve is that the area shall be managed so that its natural qualities are preserved in the long term.

Pasvik Nature Reserve.
PHOTO: Tormod Amundsen, Biotope

Presentation and discussions on climate futures for Pasvik. Climate futures have been presented and discussed with different group constellations in Pasvik. PHOTO: Tiia Kalske

The main **conservation values** and the purpose of the Nature Reserve is to preserve:

- a wetland area that is a very important nesting and resting site for birdlife - a variety of species of ducks, geese, waders, and whooper swans.
- wetlands and river. Parts of the Pasvik river where the original riverbed remains intact.
- a classic locality with rich natural and cultural history of great scientific and educational value.

There are many user interests in the area: hydropower, private property ownership, outdoor recreation and birdwatching, research and education, hunting, boating, reindeer herding, the military, border control, and police.

The aim of the pilot was to provide climate-informed input into the later planning process for a visitor strategy for Pasvik Nature Reserve.

The piloted climate adaptation planning process started in March 2025 and was finalised in in early 2026. **The planning team** consisted of one team leader and four participants. A summary of the planning process design is illustrated in Figure 19 (page 41).

The pilot planning process - a narrow scope exploratory approach

A core working group was assembled to work through steps 1-5. The group had 1-3 meetings per step from March to December 2025. For each step, they worked with all resources one at a time, before moving on to the next step. A working document with background information and worksheets for step 1-5 from the self-guided workbook (NPS, 2025) was compiled and consistently maintained leading up to the identification of climate adaptation actions for selected resources. The documented results will be used as a background material for the coming planning process for the visitor strategy.

Step 1. Inform the planning process

Defining the scope and current management goals

The planning effort had a narrow, scope, exploratory approach, since it covered few resources and was not closely tied to management decisions (will inform the later visitor strategy planning process). The focal resources and values (chosen together with Reisa National Park and the Nansen Center) were: *nature and animals* (birds: migration, food availability and range shifts), *vegetation* (forest fire risk in old growth pine forest) and *outdoor activity* (transport on river ice in winter and transport on the river in summer).

The **timeframe** used for analysis for Pasvik Nature Reserve was 2051–2075. The **geographical scope** was defined to be the Pasvik Nature Reserve area.

Background information collection

The core documents used in the climate planning process were the legislation, current management plan and the climate assessment report for Pasvik Nature Reserve. Other relevant information was retrieved from the Pasvik-Inari TBA/Transboundary Area action plan and other literature.

Climate data

A Climate report (References page 62) was procured from the Nansen Center, and **climate futures were developed** in a joint dialogue. One climate future was for the timeframe 2051–2075 and a medium emission level (RCP 4.6). The other climate future was for the end of the century under both low and high emissions scenarios, to cover potential extremes. The climate projections were based on high-resolution climate projection models. Six focal resources and values (related to ecosystems, birdlife, and visitor management) were selected for the later assessments of how they would be affected under different future climate scenarios. The information from the web-based application developed by the Nansen Center was summed up in tables (one example in Table 5). The climate projections will be used in the process of developing a visitor strategy for Pasvik Nature Reserve.

Engaging participants and partners

The core working group consisted of a process leader, two representatives from the County Governor of Troms and Finnmark, the National Park Manager for Reisa, the National Park Manager for Øvre Pasvik and the National Park Manager for Seiland national parks. Relevant experts such as BirdLife Norway and the military were included in the process when relevant.

Step 2. Assess climate vulnerabilities and risks

In step 2 **assessments of climate vulnerabilities and risks** for each climate future were discussed by the core working group and summed up in tables, using the NPS workbook (NPS, 2025), one for each of the chosen values. The central climate drivers were reviewed for each value, then vulnerabilities and risk were listed and discussed. Based on this, short narrative scenarios were developed (Figure 18). The group found step 1 and 2 easy to work with, using the background documents in the process.

Step 3. Evaluate climate implications for management goals

The feasibility of Pasvik Nature Reserve's **existing management goals was assessed** and found to be too broad and not climate informed for most parts. In step 3 suggestions for **new and updated climate informed management goals** were drafted, for the purpose of piloting this climate

Table 5. Review of future climate – wildfire risk in old-growth pine forest

What are the possible consequences for wildfire risk in the future? Data compiled from the web application developed by NERSC (References, page 62).

Climate future (climate drivers)	Historical baseline	Green RCP 2.6	Yellow RCP 4.6	Red RCP 8.5
Days without rain (10 consecutive days)	62	4.8	-8.8	-15.4
Consecutive days without rain	12	0	-0.8	-2.2
Soil moisture (g/kg, summer)	580	-18	0.5	2.4
Temperature °C (summer mean temp.)	10.8	2.5	6.1	8.6
Precipitation (mm/day, summer)	2.13	-9.9%	10%	19%

Figure 18. Developed future climate scenarios for forest fire risk in old growth pine forest

DRY ZONE
Drier and it burns more often

Increased wildfire risk
In this scenario, the risk linked to dried-out soil and the need for preparedness is highlighted.

MOIST BUFFER
Warmer and wetter

Stable moisture
In this scenario, nature still has a protective level of moisture that reduces wildfire risk.

Remnants from an earlier forest fire. PHOTO: Rolf Sch. Kollstrøm

More moist old pine forest in Øvre Pasvik. PHOTO: Tommi Nyman adaptation process in a realistic way. Step 3 was more challenging to work with, but discussions were fruitful and rewarding. The results from step 3 will be used to inform the visitor strategy work when relevant for respective resource (for example when conducting specific expert meetings with e.g. military border guards, birdlife experts etc). The results will also inform later decisions if/when the management plan will be revised, or a separate climate change plan is made.

Step 4. Identify potential adaptation strategies

Possible adaptation actions were identified, using the RAD framework (page 15). The short narrative climate scenarios from step 2 were used in step 4, to brainstorm potential adaptive actions. Using RAD for brainstorming was easy, but to categorize them under either Resist, Accept or Direct was somewhat difficult, since some of the actions could be placed under at least two of the categories.

Step 5. Evaluate and select priority adaptation strategies

Adaptive actions from step 4 were listed, discussed, evaluated for feasibility and scored. At the end, actions were ranked according to their score. Discussions on how feasible some actions may be were fruitful. Here is one example of a priority action identified in the Dry zone scenario:

Increased forest fire risk highlights the need for preparedness and clear information. Forest fire risk is forecast and fires are usually extinguished today. Knowledge about fire history and fire as an ecological process should be strengthened, and a plan for controlled conservation burning developed.

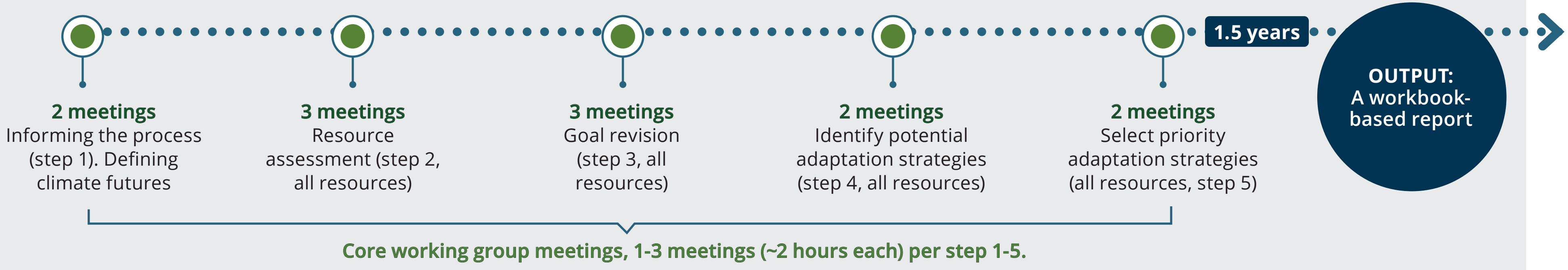
Outputs and next steps

Priority adaptation actions from step 5, will be worked on at a later stage. The results are documented in *Arbeid med klimaframskrivinger for Pasvik naturreservat* (in Norwegian) and will be used when working with the visitor strategy for Pasvik Nature Reserve. The results will also be shared in relevant fora externally and internally. The new/updated suggestions for climate informed goals will be considered in the future if and when the current management plan is revised, and or a separate climate change plan is developed.

A FINAL REFLECTION

Working with the NPS methodology has been both insightful and motivating. Reflecting on diverse climate futures has encouraged us to deal with uncertainty proactively—exploring what could happen and preparing for multiple outcomes. This approach strengthens long-term thinking in conservation and reminds us that our management must evolve as conditions shift.

Figure 19. Planning process design - a narrow scope exploratory approach



Adaptation planning pilot in Oulanka National Park

FOCAL QUESTION:

"How will climate change affect nature habitats and recreation in Oulanka National Park?"

Oulanka National Park is one of Finland's most famous national parks, where you can admire waterfalls and scenic canyon valleys. The Oulankajoki and Kitkajoki rivers offer excellent conditions for paddling. Finland's most popular hiking trail, the 82 km-long Karhunkierros Trail, runs through the park.

Oulanka, with a surface area of 256 km², was established in 1956. The park's steep ridges, deep valleys, wide mires, big meadows, hills, and ravines have created microclimates where many unique species of plants and animals have thrived. A significant number of species, many endangered, have their only or most significant range here.

This part of eastern Finland is the area where traditional farming ends and reindeer husbandry begins. Several of the wilderness huts were originally built for reindeer herders, and old grain mills and hay barns are what remains of the original crofts. The current network of campfire site huts and trails is extensive and has around 180 000 visits per year.

The overall purpose of the pilot was to integrate climate change adaptation into management planning. The pilot aimed to use scenario analysis to understand the severity of climate change impacts and to craft robust adaptation options, resulting in a first-ever climate-informed management plan.

The Oulanka pilot was planned and executed by a project manager and an internal planning team consisting of 10 specialists. A summary of the planning process design is illustrated in Figure 20 (page 46).

Oulanka river flows through the National Park. PHOTO: Metsähallitus

The pilot planning process - a broad scope decision-oriented approach

The NPS planning steps were applied to the current, predefined management planning process. This work included 20 online project meetings, one in-person stakeholder meeting, and a stakeholder questionnaire that was open for a month.

Step 1. Inform the planning process

Background information collection

To start with, the planning team examined the current Oulanka Management Plan (2012-2026) and its interim review. We analyzed the implementation and lessons learned. Since the current version was created over 10 years ago, we noticed the conservation values, goals, and objectives needed to be updated.

The Principles of Management Planning (2025) were also reviewed. The document describes the practices and principles for the conservation and management of natural habitats, species and cultural heritage, as well as the steering of recreational use, wildlife management and other forms of use in protected areas, to ensure their sustainability.

Defining the scope and current management goals

For the pilot, *a* selection of *habitat types* and *recreational uses* were defined as focal resources to examine from a climate change adaptation perspective.

The selected five *nature habitats* represent the nature of Oulanka National Park:

- **Frost moss springs** (small in surface area, rich in species)
- **Limestone cliffs** (small in surface area, rich in species)
- **Dry deciduous forests** (rich in species)
- **Riverine nature** (Kitka and Oulanka) (large in surface area, characteristic for the park)
- **Aapa mires** (large in surface area, characteristic for the area)

Canoeing by the river banks in Oulanka National Park. PHOTO: Metsähallitus

Suspension bridge at Harrisuvanto on Karhunkierros hiking trail.
PHOTO: Metsähallitus

Reindeer roam in the Oulanka National Park.
PHOTO: Metsähallitus

Marsh tea is a typical sight.
PHOTO: Metsähallitus

The selected focal resources for analysing climate impacts on recreational use were the maintenance of camp sites (huts) and the Karhunkierros Trail. The ice-covered period of the Oulankajoki River has decreased by two months in the past 50 years. Several huts along the Karhunkierros Trail are by the river. In fact, the whole CLAP project originated in a discussion about "how to maintain huts when the river no longer carries snowmobiles, and there is no alternative land route".

Climate data

Climate projections were ordered from Finnish Meteorological Institute (FMI). The report Climate Futures of Northern Nature Reserves by the FMI provided two climate futures for Oulanka National Park. The two climate futures for 2041–2070 and 2071–2100 include selected climate drivers and represent projections based on a set of climate models.

The climate drivers selected by the planning team were based on the five selected focal habitats and the two focal recreational uses. Main criteria were the strength of impact to the focal resource. We assessed the impact strength of the drivers on a scale from 1 to 3 (low–moderate–high). The drivers with the highest total score were selected. It was challenging to understand which drivers are most critical for the focal resources, especially for the habitats. The success of habitats is a sum of several factors, and now the task was to pick the 'most important' factor, which would hopefully also be relevant for other habitats. Even research can struggle to say for certain, but the final list of 18 drivers was compared with lists from partner organizations and similar projects to ensure our thinking was on track.

In hindsight we realized, it would have been useful to go through all habitat types in the area and consider which are most concretely affected by climate change, and where we can affect the outcome with our actions.

Engaging participants and partners

A stakeholder group of 29 participants were invited to the in-person stakeholder meeting, and to participate in a stakeholder questionnaire. The planning team of 10 subject matter experts participated both in the stakeholder meeting and in the 20 project meetings.

Step 2. Assess climate vulnerabilities and risks

To start with, a vulnerability assessment for all the conservation values in the protected area was completed. The vulnerability assessment follows an official protocol, where internal and external threats (climate and other), their significance, timing, scope in surface area and possibility to influence each resource is assessed.

Then, each of the seven focal resources and their vulnerability for both climate futures were assessed. We noticed that one climate future may benefit a habitat type while another may be harmful to it. For example, for limestone cliffs a drier future with moderate increase in precipitation is a much better forecast than wet future with warm winters with heavy precipitation. With hindsight we also understood that using external experts for analyzing climate impacts on habitat types would have been helpful, since there is so much uncertainty in knowing how different climate variables impact a nature habitat.

Step 3. Evaluate climate implications for management goals

The goals of the current management plan were reviewed, and a need to reduce the number of different goals was identified (guidelines have changed over the years). The current maximum is ten goals (previously 16), which is why new goals were made without excessive comparison to previous ones.

Nine new goals were then crafted, as well as objectives for the Oulanka Management Plan. Seven of the goals were new or updated, and **two were new climate-informed goals**. Special attention was paid to the wording of the goals, making them more specific and directed, reflecting the desired future state. For the five nature habitats, one shared climate-informed goal was created to cover them all. For recreational resources a separate goal, which covers trails and buildings more broadly in the whole national park (i.e. not only the focal resources/recreational use), was formulated.

Step 4. Identify potential adaptation strategies

The planning team created new adaptation strategies corresponding to two of the new climate-informed goals. The RAD-framework was used to formulate the objectives as adaptation strategies; creating one strategy for resisting, one for accepting, and one for directing change. The team found it challenging to consider *accepting* as an adaptation strategy for natural resources. In the case of recreational use, for example, giving up a rest area is easier to accept than "giving up" on a habitat type.

When writing the objectives, the team realized that riverine nature is essentially a whole ecosystem - including water quality, aquatic mosses, aquatic plants and aquatic insects together with the fish species and floodplain meadow - rather than a single nature type. Thus, it was problematic to determine where to focus.

Discussing desired or possible future states for the focal resources was interesting but by no means easy. As managers of the protected area, we mainly have the power to affect recreation facilities. For example, if Karhunkierros cannot be maintained by transportation on the river in the future, do we strive to maintain the legendary trail route where it has always been at nature's cost, or do we discontinue the maintenance? These discussions stir up basic assumptions and values of a management organization and force it to think about things in the long term.

When ready with objectives, we documented corresponding actions for the adaptation strategies by using the RAD framwork.

Step 5. Evaluate and Select Priority Adaptation Strategies

The adaptation actions were scored based on two criteria; effectiveness and feasibility. The scores were summed up, and the actions under each climate-informed goal were ranked in terms of total score. In the process of scoring, we noticed it is important to be very clear about what effectiveness and feasibility mean in practice, and how they should be interpreted. Otherwise, the scoring will be misleading. We also noted that broader actions were assessed to be more effective. For example, actions targeting habitat types received a higher score than actions targeting specific species.

In a summary for each climate informed goal, a description was included on how the scoring can be used to guide implementation. For example, whether it makes sense to implement the highest-scoring action first or choose another. It is worth noting that actions under the *resist* strategy were often chosen by the project group to be implemented first, followed by actions under *direct* and *accept* strategies, either in parallel or sequentially.

The chosen implementation order of different strategies depends on the conditions, how they change, and the specific goal being addressed.

In the interim review, estimated to take place in 2030, Metsähallitus will assess whether the actions have been effective, moving toward the desired state, or whether a different adaptation strategy should be considered.

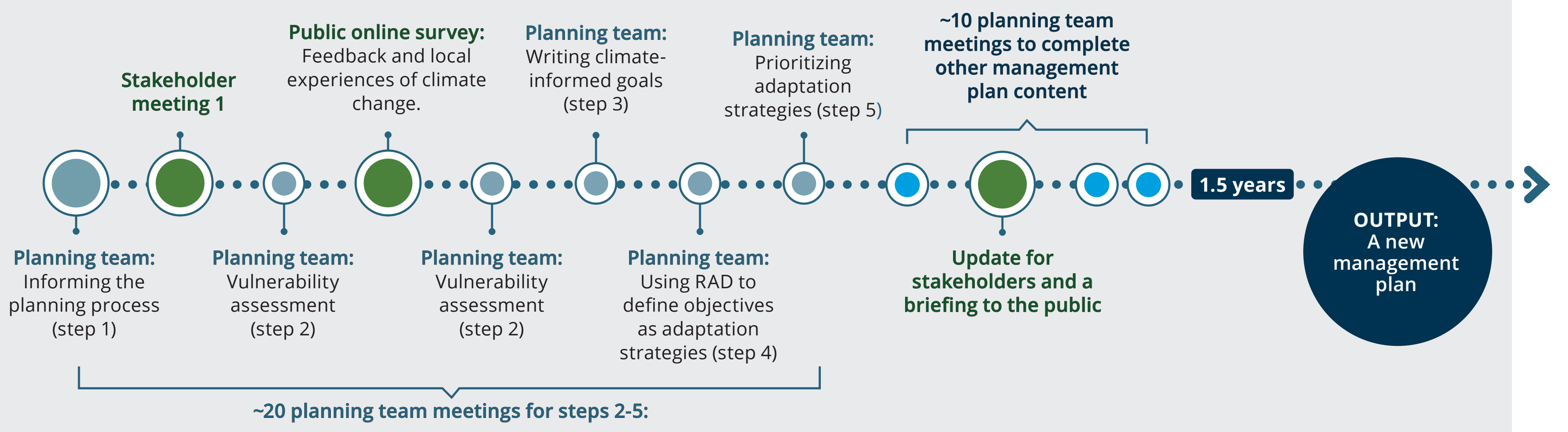
Outputs and next steps

The Oulanka National Park Climate Informed Management Plan is estimated to be ready in the end of 2026. It will be available, in Finnish language, in the public Metsähallitus Publication Database. In the interim review, estimated to take place in 2030, Metsähallitus will assess whether the actions have been effective, moving toward the desired state, or whether a different adaptation strategy should be considered.

A FINAL REFLECTION:

Adapting the NPS methodology to an existing planning process and management system brought its own challenges. For the future, we recommend carefully considering which parts of the management plan truly require scenario-based planning—such as the most critically affected species and habitat types—and which do not, for example gravel trails on flat terrain.

Figure 20. Planning process design - a broad and decision oriented approach



Myllykoski rapid is one the main sights in Oulanka National Park.
PHOTO: Shalamov/mostphotos.com

Advice for Planners

The advice presented here is a summary of project partners' joint lessons learned from piloting Scenario-based Climate Change Adaptation Planning (CCAP) in Scandinavian protected areas.

Recommendations presented are both general and specific for each step in the planning process. At the end of the chapter, additional advice on ordering climate futures and selecting climate drivers are presented, together with advice on selecting geographical scope and timeframe, as well as some words on the importance of divergence in climate futures and scenarios. More lessons learned from each planning approach can be found in the chapter *Piloting Adaptation Planning* and in the pilot reports (see References, page 62).

A general conclusion from piloting NPS planning methodology is that it is a valuable tool for navigating uncertainty and supporting conservation planning. It is a flexible methodology that can be tailored for different planning needs – from exploring options to making decisions. There is valuable guidance to support the choice of approach and case studies to be inspired by, together with other resources to aid planning.

There are many methodologies for climate change adaptation in protected areas, both in Europe and in the US. Using an existing methodology, together with available and relevant tools, is recommended for planners and managers of protected areas when working with climate change adaptation. The choice of methodology may be less important since they seemingly share main components (page 8 and Miller et al., 2025). Sharing experiences on tools, practices and case studies between managers using different planning methodologies could further aid climate adaptation planning and implementation in protected areas.

Field work in the Swedish fell area.
PHOTO: Jan -Erik Nilsson

General recommendations for a successful planning effort

Mandate and Organizational Support:

- Secure leadership backing to emphasize the importance of CCAP.
- Decide which planning approach (page 16) suits you and scale the process according to your resources.
- Work to integrate the methodology into the organization's planning system.
- Document and disseminate your learnings – to build capacity within the organization.

Workshop with stakeholders in Abisko. PHOTO: Anna Berhan

Time and Resources:

- Allocate sufficient time, often more than initially anticipated.
- For an effective process, consider a combination of live and online meetings.

Utilize existing resources to aid the planning process such as:

- NPS report *Planning for a Changing Climate* (2021), detailing planning steps.
- Relevant Climate change adaptation planning approaches (e.g., see NPS webpage Scenario-Based Climate Change Adaptation Showcase and the planning pilots in this handbook).
- The Self-guided Workbook from NPS (2025) with worksheets for step 1-6, to guide and document the process.
- Tips for climate-informed goal revisions (step 3) and application of the RAD framework for finding different strategies (step 4) (see Resources, page 64).
- Training material, e.g. from the course *Planning for a Changing Climate* (page 58).
- Workshop tools or an experienced facilitator, for an efficient process. Support from someone with experience in climate adaptation planning is also valuable.

Involving stakeholders:

- Including different stakeholders and expertise adds perspectives, knowledge and values, which helps in understanding, prioritizing, and later implementing adaptation strategies.
- Participants find it rewarding and engaging to discuss how the future might impact key resources and to identify adaptation options.
- Networking (both internally and externally) improves the potential for future collaboration, a positive side effect of a collaborative planning process.

Lessons learned Step 1

Building blocks in Step 1, Inform the planning process:

- Define scope and current management goals.
- Engage participants and partners.
- Compile relevant background and context information.

- **Find a manageable scope for the planning effort** ("dare to keep it small").
- **Form a core planning team of 2-4 people** with dedicated time to work with the planning effort to avoid delays.
- **Provide the team with capacity building** on CCAP methodology and the organization's existing planning processes or management/ planning systems.
- **Compile existing management goals** as best you can. The goals can be entered in worksheets in NPS Self-guided Workbook (NPS, 2025) that can be used during the planning process.
- **Decide the involvement of stakeholders and external partners.** Map and select them according to the scope and needs of the planning effort. Map possible specialists (researchers, biologists, etc.) to consult. An early and broad stakeholder engagement can help explore options. Include participants with local knowledge.
- **Develop (or update) a Climate-Sensitive Priority Resource list**. Identify the most climate change affected resources/values early in the process. Available climate projection data can help make an estimation for the habitats in the protected area.
- **Don't get stuck in choosing climate drivers;** focus on those most relevant to the resource or area, make a guess based on available knowledge or experience, use general climate drivers or consult experts. For decision-oriented approaches, ordering detailed climate futures with specific drivers is recommended. For exploratory approaches, climate driver projections from open data are often good enough. Read more about ordering climate data on page 53.

Reindeer in Reisa National Park. PHOTO: Asgeir Blixgård

Lessons learned Step 2

Building blocks in Step 2, Assess climate vulnerabilities and risks:

- Identify projected climate futures and other conditions
- Assess climate vulnerabilities and risks

Discussion around the fireplace at Ovi Raishiin visitor point, the main entrance to Reisa National Park. PHOTO: Nina Storm

- **Try to create divergent climate futures (page 53). For example:**
  - » highlight the divergence visually in a table (arrows to show an increase/decrease) or in bullet form (e.g., growing season: 3 months vs. 4 months).
  - » Create more divergence by using “tipping points”, “wild cards” or ”black swan events” (sudden events that might occur and can cause a big shift for a resource).
- **Provide participants with a summary of each climate future, highlighting key metrics and differences between them.** Present them in an understandable way to ensure meaningful discussion. Visual aid and descriptive titles are helpful. Revisit the summaries throughout the process or workshops.
- **Provide relevant background information for participants** - linking focal resources and their vulnerabilities to climate impacts and challenges. For some subjects (e.g. nature tourism), providing information on related trends and key data for the area can support the process.
- **Allow ample time for discussion** of background information and climate drivers for the resource/s, before scenario exercises.
- **Analysing climate impacts for a selected focal resource can be challenging**. External experts may be needed, and even then the impacts are, at best, informed estimates. However, discussions will bring us closer to finding answers and help us identify lacking knowledge.
- **Brainstorm possible events/effects and discuss challenges/opportunities under each scenario** - important for the continued process.
- **Narrative scenario presentations enhance memorability.** The narratives can be presented by, for example, creating a play, news headlines, a dialogue, or a descriptive text. To save time, AI tools can assist in narrative production.
- **Be prepared to steer participants away from jumping to solutions.** Participants may want to start step 4 directly after step 2. It is important to first go through step 3 to assess whether existing goals are feasible considering climate change and revise them if needed.

Lessons learned **Step 3**

Building blocks in Step 3, Evaluate climate implications for management goals:

- Evaluate existing goals (are they relevant and feasible in the light of expected change?)
- Create climate-informed goals (if needed)

- The evaluation of management goals should include park staff familiar with goals and resources in the area. Also consult other experts if needed.
- Developing new, climate-informed management goals requires time. Don't get stuck in wording early in the process.
- Management goals are often vague. Evaluating goals raise awareness among participants about the quality of existing goals and is rewarding, even if new goals aren't created.
- Tips for climate-informed goal revisions can be useful (List of Resources, page 64).

Stakeholder workshop in Abisko. PHOTO: Ida Nutti

Lessons learned **Step 4**

Step 4, Identify possible adaptation strategies, includes:

Identify a broad array of possible strategies to address climate vulnerabilities and risks. Be creative and innovative, also consider approaches for a longer term. Consider approaches that resist, accept, or direct change.

- Discuss which drivers are most relevant before brainstorming adaptation strategies.
- It is suitable to divide work groups according to focus areas.
- The brainstorming phase was well-received by participants, generating many suggestions.
- The RAD framework helps widen the range of adaptation options. However, categorization into Resist, Accept or Direct can be challenging. It is advisable to not get too caught up in definitions, especially when trying to categorize actions for Facilities or Visitor experience. The RAD tool works better for Natural resources, which it was initially developed for.
- It often becomes clear in Step 4 that the management goal needs to be revisited, as discussions may reveal that a goal needs to be clarified or that it unintentionally excludes some of the proposed strategies.
- Allocate sufficient time for subgroups to present their suggested strategies for others. Large group discussions broaden perspectives and arelikely to improve outputs.

Lessons learned **Step 5**

Step 5, Evaluate and select priority adaptation strategies, includes:
Evaluate possible adaptation responses (from step 4) for their performance against multiple scenarios and their ability to achieve climate-informed goals. Are they feasible, effective, robust etc.

- Choose relevant criteria (for example feasibility, effectiveness) and a simple rating method for the evaluation.
- Discuss evaluation criteria (such as how to interpret *Feasibility*) with participants to ensure mutual understanding.
- Ensure adequate time for effective evaluation and prioritization. Discussing and evaluating suggested actions takes time, especially if there are many suggestions.
- Consider expanding discussion of strategies to explore their robustness (how well actions work under different scenarios), interdependencies, possible conflicts or combinations, win-wins and timeframes (short- vs long term).

Creating climate futures

In Step 2 of the planning process, the impact of climate change on focal resources, i.e. their vulnerability, is assessed with the help of climate futures. Climate futures are acquired by modelling a selected set of climate projections for a specific timeframe and area, using specific climate drivers.

To create climate futures for a National Park, you need to select a set of climate drivers that have the potential to directly or indirectly affect the park's resources and assets. Many countries have open sources of climate change data. These services usually include various climate variables related to precipitation and temperature. Projections of climate drivers from open sources can be enough to assess potential future climate impacts, especially in exploratory planning efforts. However, for planning efforts more closely tied to decisions and needing more in-depth analysis of resources, it may be needed to acquire tailormade climate futures based on more specific climate drivers. These can be developed for a specific geographical area and with a pre-defined time span. When ordering climate futures, you have the possibility to include climate drivers relevant to your focal resources that are not found in open sources.


Views in Reisa National Park. PHOTO: Asgeir Blixgård

Potential providers for climate futures are national meteorological institutes, public and private research centers, or consultant agencies. For the CLAP project's pilot planning processes, Finland ordered climate futures from Finnish Meteorological Institute (FMI), Norway from Nansen Environmental and Remote Sensing Center (NERSC) and Sweden from the Swedish Meteorological and Hydrological Institute (SMHI).

Selecting climate drivers

The process of ordering climate futures starts with deciding what climate drivers to include. To do that, you may need to define climate drivers that can tell you what you want to know. Defining climate drivers is a challenging task if you don't know which drivers are likely to impact your selected resources.

To start, you need to recall what resources the planning effort concerns. You may also consider discussing with park staff what changes in weather conditions they have noted related to those resources. Usually, the staff have notions about snowfall, extreme weather events, heat waves etc. This knowledge can then be combined with what climate experts say about climate drivers and what kind of change they represent best.

The selection of climate drivers can also be approached by thinking about the weather conditions that are needed for a certain activity to be possible. For example, which snow conditions are needed for cross-country ski tracks to be skiable? The ground, mires and small bodies of water must be frozen for the grooming machine, and there must be enough snow. These requirements can then be summarized (Table 6).

After crafting a preliminary list of climate drivers, each climate driver can be given a score, for example, on a scale of 1-3 (low-medium-high) to rate its impact on a focal resource (Table 7). The total score indicates the relevance of the climate driver. Climate drivers with the highest total score can then be selected to be part of the climate futures. Total number of climate variables may vary depending on your planning approach and the number of resources included, but 5-15 is a reasonable amount, since too many might be hard to grasp and include fully in the planning effort.

Table 6. Defining climate drivers

The table shows an attempt to define required conditions for cross-country ski tracks to be skiable, leading to relevant climate drivers to select.

Required condition	What does the required condition indicate?	Definition	Unit	Climate driver
Minimum of 20 cm of snow	Cross-country and snowmobile tracks can be groomed, which indicates the start of winter tourism season.	Snow depth permanently ≥ 20 cm	No. of days	Duration of deep snow cover
Frozen mires and small bodies of water	Cross-country and snowmobile tracks can be groomed, which indicates the start of winter tourism season.	The average daily temperature is permanently < 0°C	Day number	The beginning of thermal winter

Table 7. Example on scoring the relevance of a climate driver for a focal resource

Climate Driver	Unit	RECREATION		NATURE HABITATS			TOTAL SCORE relevance of the climate driver
		Karhun-kierros trail	Maintenance	Limestone cliffs	Frost moss springs	Dry deciduous forests	
Average precipitation in a year	mm	1	2	1	2	2	8
Heavy rain	mm / h	2			1	2	5
Snow cover days	no. of days	2	3		2		7
Mean annual temperature	C degrees	2	2		1		5

Selecting geographical scope and timeframe

For the geographical scope, all pilots in the CLAP project selected the protected area. Finland considered dividing the geographical scope based on vegetation zones. In that way, climate futures could have been applied to other areas. However, this approach was abandoned because it was too challenging to select the climate drivers based on the focal resources defined in the pilots. In southern parts of Finland, for example, snow would not have been a vital climate driver because there is rarely any snow.

When it comes to selecting time frame, it is good to keep in mind that for general management planning, shorter time frames (15-30 years) are often more practical, while longer horizons (30-60 or until end of century) are needed to capture broader trends. The service providers may also recommend the time frames they commonly use.

Planners in all three countries found that selecting climate drivers and acquiring climate futures for their protected areas required more effort than anticipated, taking anything from weeks to a couple of months. Specialists from different fields were needed for discussions. Parallel discussions with the service provider took place. For the service provider, it might take a couple of months to several months to deliver a climate futures report.

A discovery place in Abisko National Park. PHOTO: Anna Berhan

Creating divergence

When acquiring climate futures, you should include at least two projections, with some divergence between them. Considering more than one plausible climate future is a fundamental approach for adaptation planning, as it is an effective means to plan for dynamic and uncertain climatic conditions. Despite the inherent uncertainty about climate change, managers must make decisions. Considering multiple scenarios is more likely to prevent surprises more than assuming there is a single or “most likely” climate future. If projections of key climate drivers all move in the same direction, there is less uncertainty, but it still exists.

One way to create divergence is to use different RCPs (Representative Concentration Pathways, i.e. projections based on different assumptions about future greenhouse gas emissions). Based on two different RCPs, you will receive two different climate futures. When doing this, the divergence between different RCPs is usually greater when choosing a longer timeframe (such as the end of the century).

Considering the direction of development of all the key climate drivers can also be helpful. If all the key climate drivers are directional, i.e. change only in one direction, uncertainty is smaller than when projected developments move in different directions.

If your planning process includes building scenarios based on climate futures, additional divergence can be created by combining climate drivers with other important drivers of change, such as ecological tipping points, or extreme weather-related or other events that might occur, affecting the focal resources. The created scenarios can then be used as a basis for assessing climate vulnerabilities and risks.

Viewpoint on Pieni Karhunkierros trail.
PHOTO: Metsähallitus

Training Course "Planning for a changing climate in protected areas"

This training course was offered in February 2025 to protected area managers from the CLAP project's partner organizations. The course materials are available to any organization that would like to use them to deliver an instructor-led course (online or in person) or for self-studies.

The course was originally developed by the US National Park Service (NPS). It builds on the guidance *Planning for a Changing Climate* (National Park Service, 2021) - a comprehensive report published by the NPS to guide scenario-based climate change adaptation planning in protected areas. During the CLAP project, parts of the course were tailored to a Scandinavian context, in cooperation with the NPS.

Short course description

The training course *Planning for a changing climate in protected areas* (P4CC) provides knowledge and tools needed for climate-wise planning when managing protected areas. It teaches a structured way to analyse climate vulnerabilities and risks, develop forward-looking goals and evaluate strategies and actions considering multiple plausible futures associated with a changing climate.

The course contains a combination of pre-recorded lectures, exercises and real-world case studies.

Course agenda and delivery during the CLAP-project

During the CLAP project, the course was delivered as an instructor-led 15-hour online course consisting of a pre-course webinar (2.5 hours), and two weeks later three course days (4.5 hours each), with 1-2 days in between. See a brief course agenda in Appendix 2, page 68. More detailed agendas are available in the complete course materials.

A summary of participant's course evaluations

Daily evaluations by course participants showed that 90-100% enjoyed the training and thought the subject was relevant to their work. The participants appreciated the presentations, the organization and the well-prepared instructions. They also liked the concrete tasks, insight into a new methodology and hearing about experiences from other Nordic countries.

One challenge mentioned by participants was that it was difficult to discuss the topic in a foreign language (English). Therefore, having the course in participants' first language should be considered, or dividing groups according to native language. Some also thought the exercises were challenging, especially formulating new climate-informed goals in step 3 and using the RAD framework in step 4. Facilitators in the group discussions were important to help groups not to get stuck, and to focus on testing the different steps rather than finding the correct answers. Also, goal revision and using RAD will be easier if facilitators have more knowledge of and experience from doing these steps.

Based on evaluations, the course materials were revised, and recommendations were made for setting up a new training course.

HOW TO GET HOLD OF THE COURSE MATERIALS

There are two zip-folders – one for participants, and one for course materials.
In Norway: Contact *reisa.nasjonalpark@statsforvalteren.no*.
In Finland: *The CLAP project website*.
In Sweden: *Förvaltarwebben* or contact *norrbotten@lansstyrelsen.se*.

Course materials

There are two zip-folders available from the training course delivered during the CLAP project: one "Classroom Files" folder for participants, and one "P4CC Working materials" folder for course organizers with editable course materials. The content is summarized below:

Classroom Files folder content:

A Self-study guide & course materials (optional)

01 – Course Materials (recommended readings and a list with terms and definitions).

02 – Class Participants & Agenda (templates to be customized before course delivery).

03 – Class Activity (Abisko National Park Activity Guides – case studies and exercises for *Natural resources* and *Facilities*).

04 – Class PowerPoints & Recordings (presentation slides in pdf and recordings in.mp4).

05 – Supplemental Materials (Includes for example general templates, literature recommendations and goal revision tips. More resources relevant for the context, country or organization may be added by future users).

"P4CC Working materials" folder content:

00 – Info & planning

"About P4CC Training course_CLAP".

"Self-study guide & course materials".

"Tips for setting up a new course".

A "Facilitator agenda" template for instructors with time slots and course content information.

A "Training Planning Calendar_CLAP template" (an edited and shortened version of the internal CLAP planning document).

"CLAP participant's evaluation web form_ex".

01 – Course Materials (see Classroom Files folder 01).

02 – Class Participants & Agenda (templates to be finalized in.pdf for course delivery).

03 – Class Activity

"Class Activity groups_template".

"Tips for facilitating group exercises".

04 – Class PowerPoints & Recordings (presentation slides in .pptx (most with speaker notes) and recordings in.mp4)

Course material updates

During the CLAP project, some course materials were updated or added. Before the course delivery (February 2025), these adjustments were made:

- A few new presentations to provide examples and context related to the partner organizations in northern Scandinavia, and to complement the NPS presentations.
- The Activity Guides were updated with new case studies (for Natural resources and Facilities) in Abisko National Park.
- The Self-guided Workbook was adapted to the CLAP partner organizations' context.
- The NPS' recordings were edited and somewhat shortened.
- New evaluation forms were created, as well as a new Agenda.
- A course platform was created on Teams, where all materials were uploaded and course participants invited.

After the course some new documents were added and updated:

- The "Self-study guide & course materials" (new), to make it possible to study the course individually at any time. It also includes an overview of the course materials with the new recordings from the live sessions in the CLAP course.
- Learnings and advice from setting up and running the course were documented in "Tips for setting up a new course".

- Some planning documents and the web evaluation were edited (and added in the new folder “00”) as examples to aid future course deliveries.
- The “Self-guided Workbook” was updated with worksheet examples from the Abisko National Park Natural resource case study, as well as with some changes in the instructions, inspired by exercise answers and our experiences from the course.
- “Advice on goal revision” has been added.
- New recordings of the live sessions in the CLAP course delivery were added.

Setting up a new training course

The course can be delivered online or in-person. In both cases, the pre-recorded presentations can be used more or less as they are, combined with live facilitation, discussions and exercises. Different modifications and adjustments of the course materials can be done to suit the course context, depending on how much effort and time you are willing to put into it. Here are some ideas:

Language: You may apply the training course materials differently depending on the groups’ native languages and skills. For example, the existing recordings in English can be combined with in-person exercises in your own language (as many may understand well when listening to English but prefer to discuss in their own language). Translated captions can be added to presentations in English, and/or documents translated to the desired language.

The agenda: may be adjusted depending on if the course will be delivered online or in-person, which mainly affects length and pacing of the course days, exercises and breaks.

Length and pacing of the course days:

- For an *online course*, we recommend maximum 4.5 hour sessions, as it is tiring to do the training in front of a computer. One hour lunch breaks seem to be suitable when the training is longer than 4 hours.
- If delivered *in-person*, the course days can be consecutive and longer.

Consider allowing more time for exercises/discussions, especially for:

- *an online course in English* with non-native speakers; 5-10 min can be added for some of the exercises. However, for an online course in your own language, it is not certain that it adds quality to allow for more time, as it is also challenging to participate in long sessions online. The point of the exercises is mainly to understand the principles, not to produce realistic and complete answers.
- *an in-person training*; enabling more time on the worksheets could work particularly well if the training concerns for example a single park or “case study” where real-life examples from the park are worked through with its staff.

Consider making short breaks of 10 min (better than 5 min) - apart from that, the overall agenda and times in the CLAP-course delivery worked fine.

Preparation time and team: Start well in time with preparations. The time it takes to set up a course depends on how many modifications you want to make. For the CLAP course delivery, the course materials were modified over a period of five months, but with little or no modifications, the course can be set up in short time.

In the CLAP project, a core planning team comprising three people set up the course, assisted by two persons who produced the case study and assisted in the group work during the course delivery.

See more details and recommendations on how to set up a course in the document ”Tips for setting up a new course”, which is included in the course materials.

Hetta-Pallas in Pallas-Yllästunturi National Park is the first marked hiking trail in Finland. PHOTO: Metsähallitus.

Final words

In summary, piloting the U.S. National Park Services (NPS) scenario-based climate adaptation planning methodology within the CLAP project - supported by initial training and guidance from the NPS - proved successful. Project partners can confidently recommend that other protected area management organizations apply this methodology and make use of the extensive and accessible NPS guidance materials available online.

Scenario-based adaptation planning is particularly well suited to addressing climate uncertainty and can be effectively integrated into a wide range of planning and management processes.

Piloting a climate adaptation planning process is challenging and time-consuming. Before initiating the process, it is important to clearly define the purpose of the planning effort and the type of outputs desired. The scope and ambition of the process should be balanced against available time, staff capacity, and data resources.

Active involvement and collaboration with stakeholders and partner organizations strengthen the planning process and lead to more robust and widely supported outcomes. Early and continuous engagement helps reduce potential conflicts, builds shared understanding, and increases motivation to work collectively on climate change adaptation.

Two main challenges for CLAP partners when applying the NPS methodology concerned how to develop climate futures based on available and affordable projected climate data and how to integrate the methodology into existing planning processes. Additional work at the organizational level will be required to further roll out the methodology.

To effectively address climate change, protected area managers must build capacity and systematically integrate climate considerations into planning and management. Adaptation strategies and actions should be implemented, monitored, and evaluated as part of an iterative learning process that incorporates updated climate projections over time.

Given the complex and interacting effects of climate change on Arctic ecosystems, collaboration and knowledge exchange between managers, researchers, and other knowledge holders is essential. Monitoring outcomes not only advances scientific understanding but also supports adaptive management by informing adjustments to policies and practices.

Although climate change adaptation work requires time and effort, proactive adaptation planning is likely to reduce the need for expensive, climate-related emergency actions and limit the irreversible loss of species and nature types.

Climate change is here – plan for it!

Larry Perez, NPS

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Web applications:

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Visualization and climate metrics for Reisa National Park: *https://seasonalforecastsfornorway.shinyapps.io/Reisa_app/*, Nansen Environmental and Remote Sensing Center, *https://nersc.no/en*

List of Resources

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Case studies

Here are some NPS project examples where different approaches have been used. For more information about these and other adaptation case studies and resources, visit the NPS *Scenario-Based Climate Change Adaptation Showcase* website or contact *climate_change@nps.gov*.

Narrow scope/exploratory (lower left)

Isle Royale National Park (2013), https://irma.nps.gov/DataStore/Reference/Profile/2203626

Greater Yellowstone Ecosystems (2021)

Casa Grande Ruins National Monument (2023)

Chaco Culture National Historical Park and Aztec Ruins National Monument (2024), https://irma.nps.gov/DataStore/DownloadFile/704970

Broad scope/exploratory

Climate Change Scenario Planning for various Alaskan Parks (2014)

Badlands National Park and partners (2016), https://irma.nps.gov/DataStore/Reference/Profile/2233058

Broad scope/decision-oriented

Wrangell-St. Elias National Park and Preserve (2021), https://irma.nps.gov/DataStore/Reference/Profile/2301920

Devil's Tower National Monument (2019), https://irma.nps.gov/DataStore/DownloadFile/632857

St. Croix National Scenic Riverway (2023)

Narrow scope/decision-oriented

Big Bend National Park (2019), https://irma.nps.gov/DataStore/DownloadFile/631301

Denali National Park Pretty Rocks Road (2020)

Kenai Fjords National Park (2020), https://www.nps.gov/kefj/learn/management/upload/FINAL-Scenario-Report-5-27-2020-508-compliant.pdf

Lassen Volcanic Park (2021), https://irma.nps.gov/DataStore/Reference/Profile/2301604

Hike through Reisa National Park.
PHOTO: Nina Storm

APPENDIX 1

Glossary

This glossary clarifies definitions of key climate change-related terms used in this handbook and in a general climate adaptation planning context. Many of them are frequently used in the US NPS Climate Change Response Program and their guidance and publications.

Main source: Coming to Terms with Climate Change: Working Definitions, NPS, 2021

Accept change: A class of adaptation response (alongside direct change and resist change) in which managers do not intervene to alter the trajectory of change and the target responds to change autonomously (Schuurman et al. 2020).

Adaptation action: The tactical and implementation components of the management response to observed climate changes or plausible climate futures. Often intended to refer to implemented actions, but can also refer to intended actions not yet executed.

Adaptation strategy: The planning component of the management response to observed climate changes or plausible climate futures. An adaptation strategy is implemented to manage potential risks stemming from vulnerability of a resource to climate change impacts or natural hazards exacerbated by climate change.

Climate: The average weather patterns or trends for a region over a period of many years; components usually include seasonal patterns of temperature, precipitation, wind, relative humidity, etc. Climate "normals" are the averages of climate variables for (typically) a 30-year period.

Climate change: A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer.

Climate change adaptation: An intentional management response to observed climate changes or plausible future changes that involves identifying, preparing for (e.g., developing strategy and specific actions), and responding to (e.g., implementing actions) those changes. The desired outcome from the management response is to retain current conditions, recover from climate variations (perhaps to an altered state), or adjust to changing conditions that may include major transformation in practices or state. Adaptation may seek to "moderate harm or exploit beneficial opportunities" (IPCC 2014).

Climate driver: As used in this context, climate drivers (sometimes referred to as climate metrics or variables) are any climate-related factors that directly or indirectly affect, or have the potential to affect, a park's resources and assets. For this use, common climate drivers include temperature, precipitation, sea-level, and snow cover.

Climate future: A description of the physical attributes of climate that could plausibly occur at a specific place and time in the future (Runyon et al. 2019). A set of climate futures is the foundation for constructing climate-resource scenarios (see scenario). A plausible climate future is based on the best available science. In a given planning context, a climate future's usefulness increases as the climate metrics used to define it are more directly relevant to the management decision. Typically, multiple climate futures are used to consider the range of ways climate could change.

Climate model: A numerical representation of the climate system based on the physical, chemical, and biological properties of its components, their interactions, and feedback processes, and accounting for some of its known properties. The climate system can be represented by models of varying complexity (IPCC 2014).

Climate projections: The simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission/concentration/radiative forcing scenario used, which is in turn based on assumptions concerning, for example, future socioeconomic and technological developments that may or may not occur (IPCC 2014).

Climate-smart: The intentional and deliberate consideration of climate change in planning and management, realized through the adoption of forward-looking goals and explicit linkage of strategies to key climate impacts and vulnerabilities (adapted from Stein et al. 2014).

Direct change: A class of adaptation response (alongside accept change and resist change) in which managers intervene to actively influence the trajectory of change and shape change in the target towards specific desired new conditions. (Schuurman et al. 2020).

Ecological threshold: A point at which there is an abrupt change in an ecosystem quality, property, or phenomenon, or where small changes in an environmental driver produce large responses in the ecosystem (Groffman et al. 2006).

Key vulnerability: Those vulnerabilities that merit more attention because they pose the greatest risk to achieving conservation goals and objectives (Gross et al. 2014).

Mitigation (climate change context): A human intervention to reduce the sources or enhance the sinks of greenhouse gases (IPCC 2014).

Representative concentration pathway (RCP): Scenario that include time series of emissions and concentrations of the full suite of greenhouse gases and aerosols and chemically active gases, as well as land use/land cover (Moss et al. 2008).

Resist change: A class of adaptation response (alongside accept change and direct change) in which managers intervene to prevent or reverse the trajectory of change and maintain or restore the target within current or past conditions (Beavers et al. 2016, Schuurman et al. 2020).

Risk: Threats to life, health and safety, the environment, economic well-being, and other things of value. Risks are often evaluated in terms of how likely they are to occur (probability) and the damages that would result if they did happen (consequences) (USGCRP 2019). The consequences or damages are derived from the vulnerability of the thing of value (see vulnerability).

Risk assessment: The process of identifying the magnitude or consequences of an adverse event or impact as well as the probability that the event or impact will occur (Jones 2001).

Scenario: A coherent, internally consistent description of plausible future states of a system used to support planning and decision making. In the context of climate change adaptation, scenarios consist of a set of “climate futures” with their associated resource implications.

Scenario analysis: A process of analyzing possible future events by considering alternative plausible outcomes or scenarios (Gross et al. 2016).

Scenario planning: A process for exploring science-based, plausible, and challenging trajectories of future change that encapsulate key uncertainties and system responses. Considering multiple scenarios based on climate projections enables managers to update near- and long-term goals and develop strategies that can succeed under a range of possible future conditions. In some cases individual scenarios include high-consequence events, which may require specific planning.

Sensitivity (to climate change): The degree of climate change affects a resource, facility, or other target either adversely or beneficially. The effect may be direct (e.g., increased stress or mortality of cold-water fish due to increased water temperatures on exceptionally hot days) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea-level rise) (IPCC 2014).

Thresholds: A general concept from systems science referring to a situation where a small level of change in a system’s states produces a relatively large, possibly abrupt, change in system configuration or behaviour (Meadows 2008). The concept is applicable to natural systems and human-built systems (including cultural resources).

Tipping point: A level of change in system properties beyond which a system reorganizes, often abruptly, and does not return to the initial state even if the drivers of the change are abated (IPCC 2014). See ecological transformation and transformation.

Uncertainty (climate): A state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from imprecision in the data to ambiguously defined concepts or terminology, or uncertain projections of future human behaviour.

Vulnerability: The degree to which a physical, biological, or socio-economic system is susceptible to and unable to cope with adverse impacts of climate change (USGCRP 2019).

Vulnerability assessment: An evaluation of the extent to which a system is susceptible to harm from direct and indirect effects of climate change, including variability and extremes. Vulnerability is often based on measures of exposure and sensitivity with consideration for the adaptive capacity of living organisms (paraphrased from Rockman et al. 2016, USGCRP 2019).

APPENDIX 2

Course Agenda: *Planning for a changing climate in protected areas*

Pre-course Webinar

Welcome and Introductions.

Presentation: Implications of Climate Change for America's National Parks*.

Presentation: Examples of Climate Change in the Arctic protected areas of Sweden, Norway and Finland.

Self-paced Activity (personal objectives for training).

Large-group Discussion - Group share of self-paced activity.

Presentation: NPS Adaptation Planning and Management*.

Information and discussions in breakout rooms per country: Governing policies on a national level and application of the climate change adaptation cycle.

Class Activity Preview: Abisko National Park (case-study).

Day 1

Welcome and Instructions.

Presentation: Pre-recorded Refresher Course (Webinar Recap)

Small Group Introductions (breakout rooms)

Presentation: Step 1 - Inform the Planning Process.

Presentation: An example of step 1 planning in Norway.

Exercise: Step 1 - Step 1 Worksheet in Activity Guides. Small Group Activity (breakout rooms).

Full group discussion

Presentation: Step 2 - Assess Climate Vulnerabilities and Risks*

Exercise: Step 2 - Step 2 Worksheet (first 3 columns). Small Group Activity (breakout rooms).

Full group discussion. Evaluation (web form).

Day 2

Introduction and reflections from Day 1.

Exercise: Step 2 - Step 2 Worksheet (last column). Small Group Activity (breakout rooms).

Full group discussion.

Presentation: Step 3 - Evaluate Climate Implications for Management Goals*.

Exercise: Step 3 - Step 3 Worksheet. Small Group Activity (breakout rooms).

Full group discussion.

Presentation: Step 4 - Identify Potential Adaptation Strategies*.

Presentation: Example of Direct Approach: Eelgrass.

Exercise: Step 4 - Step 4 Worksheet. Small Group Activity (breakout rooms).

Full group discussion. Evaluation (web form).

Day 3

Introduction and reflections from Day 2.

Presentation: Step 5 - Evaluate and Select Priority Adaptation Strategies*.

Full Group Discussion - Q&A.

Exercise: Step 5 - Step 5 Worksheet. Small Group Activity (breakout rooms).

Full group discussion.

Presentation: Step 6 - Implement Strategies; Track Effectiveness and Changing Conditions*.

Presentation: Putting Things into Action.

Presentation: Examples of Adaptation planning approaches in the US.

Full group discussion – Q&A.

Reflections and next steps. Final course evaluation (web form).

APPENDIX 3

International and national policies affecting climate change adaptation in protected areas

The Paris Agreement

The Paris Climate Change Agreement is an international, legally binding agreement on climate change. It aims to limit the rise in global average temperature to well below 2°C relative to the pre-industrial levels and to pursue efforts to limit warming to 1.5°C. The Agreement was concluded on 12 December 2015, and it entered into force on 4 November 2016.

The UN Global Goals

The United Nations' Sustainable Development Goals (SDGs), adopted in 2015 as part of the 2030 Agenda for Sustainable Development, include several goals that address climate change and climate adaptation. The most direct climate-related goal is Goal 13: Climate Action, which calls for urgent measures to combat climate change and its impacts. It emphasizes strengthening resilience and adaptive capacity to climate-related hazards, integrating climate measures into national policies and planning, and improving education and awareness about climate change mitigation and adaptation.

EU Strategy on Adaptation to Climate Change

The European Commission adopted the new EU Strategy on Adaptation to Climate Change in February 2021. The strategy sets out how the EU will prepare for climate change and adapt to it, and how the EU will become climate resilient by 2050. The Strategy has four principal objectives: smarter adaptation by improving knowledge and managing uncertainty, more systemic adaptation, faster adaptation, and increasing support for international action.

The first European Climate Law was adopted in summer 2021 as part of the European Green Deal. The European Climate Law includes requirements concerning national adaptation plans.

The EU provides information and statistical data on climate change, vulnerability, and adaptation on the Climate-ADAPT website.

The Natura 2000 sites

Natura 2000 is the EU's network of protected areas created to conserve Europe's most important species and habitats. It aims to maintain or restore these ecosystems to a favourable conservation status while allowing sustainable human use. In the context of climate change, Natura 2000 helps protect carbon-rich habitats, regulate water, and support species as conditions shift. The network is also intended to strengthen ecosystem resilience so they can better withstand climate impacts. EU regulations recommend Natura 2000 sites to integrate climate change considerations into conservation plans, including risk assessments and adaptation measures.

Natura 2000 sites are prioritized within the 2024 EU Nature Restoration Law, introducing binding targets to restore degraded ecosystems, requiring at least 20% of land and sea areas to be restored by 2030. While Natura 2000 has traditionally focused on maintaining favourable conservation status, the new law expands its mandate to include active ecosystem restoration and climate resilience. The law also aims to meet EUs overarching goals for climate change mitigation and adaptation.

Emerald Network

Norway is included in the Emerald Network, which is a corresponding system to Natura 2000 under the Bern Convention for countries outside the European Union. The Emerald Network follows the same principles of protecting species and habitats of European importance, but it is not legally binding. In addition to Emerald Network, Norway has its own national framework for protected areas under the Nature Diversity Act, including National Parks, Nature Reserves, and Marine Protected Areas. These often overlap with Emerald Network sites, and together they cover a significant share of Norway's land and marine areas.

The 2024 EU Nature Restoration Law introduces binding targets to restore degraded ecosystems, requiring at least 20% of land and sea areas to be restored by 2030, with Natura 2000 sites prioritized. While Natura 2000 has traditionally focused on maintaining favourable conservation status, the new law expands its mandate to include active ecosystem restoration and climate resilience. The law also aims to meet EUs overarching goals for climate change mitigation and adaptation.

Management plans for protected areas

For protected areas, the mandatory management plan is a fundamental document for addressing climate change issues in an area. The management plan states how an area shall be managed to achieve its conservation goals. Climate adaptation actions cannot be implemented in a protected area if they are contradictory to the directives of the management plan. Other planning documents may exist and need to be considered, such as a visitor strategy.

Links

EU adaptation work - Maa- ja metsätalousministeriö

EU The EU Strategy on adaptation to climate change - climate.ec.europa.eu

Discover the key services, thematic features and tools of Climate-ADAPT - climate-adapt.eea.europa.eu

Adaptation planning in Finland

National Climate Change Adaptation Plan 2030

The National Climate Change Adaptation Plan 2030 presents a climate change risk and vulnerability assessment and sets out a vision and three goals for adaptation work. The goals are specified in more detail through 24 targets that are grouped under ten themes and implemented by means of the actions presented in the plan. The aim is also to develop a monitoring system to assess the progress and effectiveness of the actions. The Ministry of Agriculture and Forestry is responsible for the plan.

Metsähallitus' Climate Programme

Metsähallitus plays a key role in Finland's transition to a carbon-neutral society. The climate program promotes the achievement of Finland's climate targets: to increase the carbon sinks, carbon storage and clean energy production and to cut emissions.

Climate change mitigation and adaptation are one of Metsähallitus' strategic focuses. Metsähallitus's climate programme 2025–2030 sets the targets and defines a wide range of measures to promote positive climate impacts, reduce negative impacts, and promote adaptation to climate change.

Links

National Climate Change Adaptation Plan 2030 - Maa- ja metsätalousministeriö

Metsähallitus' Climate Programme 2025-2030 - metsa.fi

Adaptation planning in Norway

National Guidelines

Norway has a national goal that society and ecosystems must be prepared for and adapt to climate change. The Climate Act ensures the implementation of Norway's climate targets, and the annual environmental goals emphasize that nature and society must adapt to changing climate conditions. The government report *A Changing Climate – United for a Climate-Resilient Society* (2022–2023) highlights that climate adaptation must go hand in hand with emission reductions and calls for rapid action to reduce risk.

The Norwegian Environment Agency's Climate Adaptation Strategy (2024–2028) specifies objectives and measures for biodiversity and outdoor recreation, stressing that climate impacts must be considered in the management of protected areas. Legal frameworks such as the Planning and Building Act and national planning guidelines ensure that climate adaptation is integrated into planning processes.

Responsibilities are divided across sectors: municipalities are responsible for adaptation within their planning areas, while national park boards manage their respective protected areas and the County Governor oversees several Nature Reserves and protected areas. Both follow the Environment Agency's guidance to safeguard nature and outdoor recreation in the face of climate change.

Links

The Norwegian Environment Agency's Climate Adaptation Strategy (2024–2028) - miljodirektoratet.no

A changing climate – united for a climate-resilient society -regjeringen.no

Adaptation planning in Sweden

National policies and regulations

Climate change mitigation is regulated by The Climate Act from 2018. Sweden also has a long-term climate goal and short-term goals for reducing greenhouse gas emissions, based on global and EU goals. Two other important laws are The Swedish Environmental code (Miljöbalken) and The Planning and Building Act (Plan- och bygglagen).

In the National Adaptation Strategy and Action Plan for Climate Change Adaptation, the government states national adaptation goals and requires integration of adaptation into planning and sector work across ministries and agencies. Naturvårdsverket (the Swedish Environmental Protection Agency) gives guidance for general environmental and climate policies.

Climate change adaptation on the regional level

A national ordinance from 2018 governs the County Administrative Boards' general work on climate adaptation. According to the ordinance, the County Administrative Boards must establish objectives for their climate adaptation efforts, including for the management of state-owned property.

The Swedish EPA and the 21 County Administrations have a shared responsibility to address climate change affecting state owned protected nature areas. The Swedish EPA provides online information on adaptation planning to aid managing authorities on the regional level.

Links

Klimatlag (2017:720) - riksdagen.se

Nationell strategi och regeringens handlingsplan för klimatanpassning - regeringen.se

Förordning (2018:1428) om myndigheters klimatanpassningsarbete - riksdagen.se

Klimatanpassning - naturvardsverket.se

This handbook documents the main body of work and lessons learned from the Interreg Aurora co-funded project CLAP – Climate Change Communication and Adaptation of Arctic Protected Areas. We hope it will support continued climate change adaptation planning in protected areas. Much of what we achieved and tested in CLAP was made possible through the invaluable support of the U.S. National Park Service and its Climate Change Response Program.

This handbook is dedicated to Wylie Carr and the entire CCRP team. We will carry the torch forward.

PHOTO: National Park Service

Abisko National Park. PHOTO: Jan-Erik Nilsson

This handbook presents a methodology for scenario-based climate change adaptation planning in protected areas, based on U.S. National Park Service approaches and its application in five Arctic protected areas. It provides practical training insights to support managers in starting and strengthening climate-informed planning

Interreg Aurora

Co-funded by the European Union

Reisa National Park

METSÄHALLITUS
FORSTSTYRELSEN
MEAHCIRÁĐĐEHUS

Statsforvalteren i Troms og Finnmark
County Governor of Troms and Finnmark

County Administrative Board of Norrbotten