Climate Change Adaptation Planning

A Pilot in Abisko National Park 2024-2025

Interreg

Co-funded by the European Union

Aurora

CLAP – Climate change communication and adaptation of Arctic protected areas

Länsstyrelsen Norrbotten

Introduction

This report describes the process and outputs of a pilot climate change scenario planning effort for Abisko National Park in Sweden, that took place within the project CLAP – Climate Change Communication and Adaptation in Arctic Protected Areas. The process was divided into different steps with a process from the National Park Service as model. The implementation of these planning steps is presented, together with outputs and lessons learned for each step. As a background, Abisko National Park and the NPS planning method are presented shortly, including an overview of “Scenario Planning” and of “The Resist – Accept – Direct Framework”. The results from the scenario planning pilot process will inform future work on the new Management Plan for Abisko National Park in Sweden.

Jokkmokk November 11, 2025

Ida Nutti
Manager of Protected Areas,
The County Administrative Board of Norrbotten

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The CLAP Project

The main objective of the EU/Interreg Aurora co-funded project CLAP – *Climate Change Communication and Adaptation in Arctic Protected Areas* – is to develop the capacities of Arctic protected area managers in adaptation to climate change through cross-border cooperation.

Through CLAP, protected area managers in northern Norway, Sweden and Finland will learn and pilot a systematic approach to climate change adaptation planning. Within CLAP, a training program has been developed and delivered to educate managers in an adaptation planning method developed and used by NPS (National Park Service) in the USA.

This method is now being tested in the project's five pilot areas, of which Abisko National Park is one. Within CLAP, project partners will also learn how to build climate adapted trails, test electric equipment in maintenance work and develop a model for climate-wise campsites. In connection to this, Visitor centers will jointly develop and pilot new ways to communicate about climate change and its on-going effects to visitors. Together with adaptation measures, communication will help keep visitors safe, inspire climate friendly behavior and reduce possible negative impact of tourism on nature. The project will also enable staff exchange and investigate models for future cooperation between partner organizations.

By increasing the knowledge, capacity and means for managers of Arctic protected areas to adapt to the new circumstances caused by climate change, and by communicating abut it actively, we will be able to better prepare for and adapt to the risks of the changing climate.

The County Administrative Board of Norrbotten is Lead Partner EU and Reisa National Park Board is Lead Partner Norway. Other project partners in Norway are Halti National Park Center and City Governor of Troms and Finnmark. Project partner in Finland is Parks and Wildlife Finland (Metsähallitus).

Introducing Abisko National Park

Abisko National Park (ANP) measures 77 km² and mainly consists of a valley largely covered with mountain birch forest. On both sides of the valley there are mountain massifs with a height of just over 1,000 meters above sea level. The Abiskojåkka stream flows along the valley and finally plunges into a canyon between steep cliffs of hard shale and Dolomite lime. Where the stream empties into Lake Torneträsk (341 meters above sea level), it has formed a delta full of birdlife.

Abisko is known for its interesting alpine flora. The Abiskojåkka canyon and the slopes of Mount Njullá are particularly rich in calciphile, or lime-loving, plants. Thanks to careful stewardship and the protection provided by the National Park, there is today plenty of room for birds and wild animals in the Abisko Valley. Mammals like moose, hare, ermine, and lemming are common. Predators such as bears, wolverines and lynx are occasionally present. Over 200 bird species have been seen in the Abisko area.

ANP is part of a cultural landscape where people have long been herding reindeer. For centuries, the Sámi people have been using the area around Lake Torneträsk. Ancient trapping pits bear witness to the hunting of wild reindeer. Today the foraging grounds are used to feed domesticated reindeer belonging to Gabna Sámi community. Here the new-born reindeer calves find land that becomes snow free early on, with abundant forage.

The national park was formed in 1909, making it one of the first in Sweden. Some years earlier a railway was built from the mine in Kiruna to the ice-free harbor in Narvik, from which iron ore could be shipped year-round. With the advent of the railway, growing numbers of tourists found their way to Abisko and the tourist station. Alpine hikers, botanists, artists and many others have since visited the national park.

The 440 km long Kungsleden (King's trail) and several other trails and nature paths traverse the park. Hiking, cross-country skiing, backcountry skiing, snowshoeing and dogsledding are popular activities for visitors. A chairlift provides access to the summit of Mount Njullá. ANP is situated about 200 kilometers north of the Arctic Circle. The midnight sun can be seen between June 1 and July 16. Between December 5 and January 9, polar nights prevail, i.e. the sun is below the horizon all day. In recent years aurora borealis tourism has become increasingly popular.

The proximity to the Atlantic gives the climate a maritime character with mild winters and cool summers. Abisko is in a pronounced "rain shadow". When the moisture-saturated winds come from the west, they emit most of the moisture in the farthest west. When they reach the Abisko valley, the

precipitation often ceases and the clouds dissolve. Abisko is one of the places with the least rainfall in Sweden. During the period 1991-2020 the average annual precipitation was 344 mm. The breaking up of the ice on lake Torneträsk normally takes place in late May or early June. Soon after that the mountain birches leafing takes place. Defoliation occurs in the second half of September, but the ice does not settle until December.

National Park Service´s Planning Methodology

The National Park Service (NPS) has been working with climate change adaptation for a long time and developed a method for it. Their Climate Change Response Program was established in 2010. In the CLAP project, participating organizations had the benefit of learning about the method through comprehensive documentation, meetings, webinars and a study visit.

NPS recognizes the importance of addressing the effects of current and future climate change in its planning and operations, an approach known as climate adaptation. Defined as “the process of adjustment to actual or expected climate and its effects”, adaptation is a form of risk management that seeks to reduce climate-related vulnerabilities or take advantage of potential benefits.

Developing climate change adaptation strategies as part of NPS planning documents requires consideration of climate projections and other types of information that may be new to traditional planning processes. Including this information is best done at the outset of planning, not as an “add-on” after planning is underway. Climate adaptation does not require a separate planning endeavor or a stand-alone plan. Instead, one of the best ways to address climate change is through “mainstreaming” adaptation as a routine component of planning tools and processes. Climate adaptation is context-specific, and there is no single “right” approach. Addressing climate change as a routine component of park planning and decision making is the portal to adaptation.

Adaptation planning necessarily requires that park planners and managers examine climate projections for their area and actively consider a range of plausible future conditions, some of which may significantly differ from those of today

In an era of rapid climate change, parks therefore need to plan for potential future conditions that may be quite different from the past. This entails adopting forward-looking goals and implementing strategies that specifically anticipate a range of possible ways in how the future may change as the climate warms. Under such conditions of continuous change, managers will also need to examine the validity of underlying management goals against projected future conditions.

Scenario planning can inform a range of possible management options. In some cases, it may be constructive to identify robust strategies that would be effective no matter which conditions unfold in the future. Considering multiple scenarios can also help parks proactively develop strategies to

respond quickly when surprises occur. This might include putting contingencies in place to prepare for a potentially catastrophic event.

Climate change adaptation is not a "new label" put on traditional actions. Rather, it intentionally and explicitly considers the influences of climate change on park resources, assets, and values when determining how to respond. Management responses that specifically consider climate impacts thus distinguish well-conceived and thoughtful adaptation from "business as usual," which may or may not continue to be appropriate under changing climatic conditions. Adapting to climate change may alter the location, timing, or way in which traditional management tools are applied, and in some cases may require novel approaches and innovation.

Because climate change is ongoing and dynamic, decisions made now will require reassessment over time. Accordingly, it is beneficial to structure adaptation strategies as hypotheses to be monitored, evaluated, and refined as needed. Providing transparency and documenting the rationale and science that connect management responses to climate impacts will greatly facilitate this process.

Over the past century, resource management in national parks emphasized preserving existing fundamental processes and components, or where appropriate, restoration to a historical state. In many parks, managing for the persistence of existing or historical conditions will continue to be a priority. Over time, however, conditions will diverge from those experienced in the past. Some areas, for example, may undergo ecological transformation, characterized by a high degree of turnover in species composition and not just loss or decline of a single species. Adaptation includes anticipating and planning for changing conditions that are "unlikely to stabilize". In some cases, preparing for and accepting substantial change, transformation, or even loss of certain resources, assets, and values may be warranted.

In practice, actions to respond to the effects of climate change encompass a range from resisting to directing change. Managers may focus on maintaining the persistence of resources and facilities by implementing strategies that resist change. When resisting change is not viable (e.g., the cost of resistance is exorbitant or the magnitude of potential change overwhelms the technical ability to preserve resources in their current state), managers will face the decision to accept changes. For living resources, with multiple potential trajectories of change, managers may also actively direct the trajectory of change to a new desired condition.

These distinct but complementary categories of management strategies—resist, accept, or direct the trajectory of change (RAD framework)—are useful for developing a broad suite of climate change adaptation options for natural resources having multiple, plausible trajectories of potential change. The structure of the framework promotes broad thinking by encouraging development of a wide range of potential adaptation responses that include

actions in each category and transparency in identifying what each potential action seeks to accomplish. The framework is particularly helpful in developing adaptation options for natural resources, but may also prompt broader thinking for cultural resources, facilities, and visitor experience.

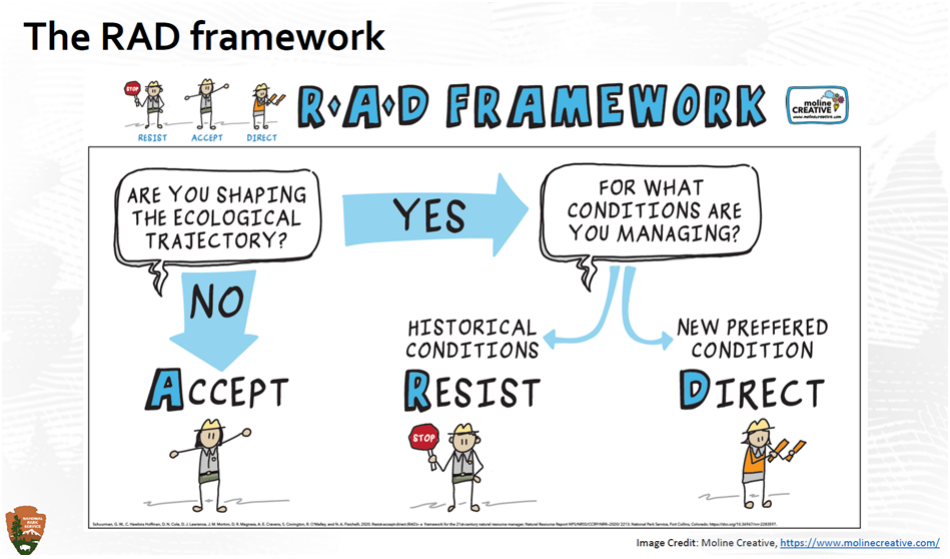

Figure 1. The Resist-Accept-Direct Framework. From National Park Service, USA.

Adaptation can involve a variety of approaches, and the appropriate response strategy will vary across resources, space, and time. Different strategies can work in complementary ways.

Efforts to enhance resilience are often cited as a viable adaptation strategy, although the concept requires careful thought and definition to be meaningful in practice. Increasingly, parks will need to determine when managing for persistence is warranted and possible, when accepting or managing for change is more appropriate, and when it may be necessary to cycle between these. Being explicit about these choices is important and acknowledging departure from "natural" conditions given the continuing nature of changes driven by a rapidly changing climate.

As climate change continues, some existing long term management goals may no longer be feasible. Consequently, successful climate adaptation requires considering the influence of climate change on our continued ability to meet current goals. This may either validate the continued relevance of existing goals or indicate the need for updates. An analysis of existing goals offers an important opportunity to establish or adjust desired conditions for the future based on sound science regarding climate projections and impacts. Parks in these situations are encouraged to

formulate climate-informed goals, which seek to strike a balance between traditional aspirations and emerging realities.

The NPS adaptation planning process is an adaptive management framework that reflects familiar stages of planning and specifically addresses the implications of climate change. As reflected in the planning cycle, adaptation is a continuing process, rather than an endpoint. Adaptation is fundamentally about risk management; thus, it is essential to identify and mitigate vulnerabilities and risks under multiple plausible scenarios of future conditions. Whether creating a new plan or updating an existing one, the fundamental components and sequencing are an effective way to address climate change in most planning processes. Note that it is common to revisit some steps based on information developed in subsequent steps.

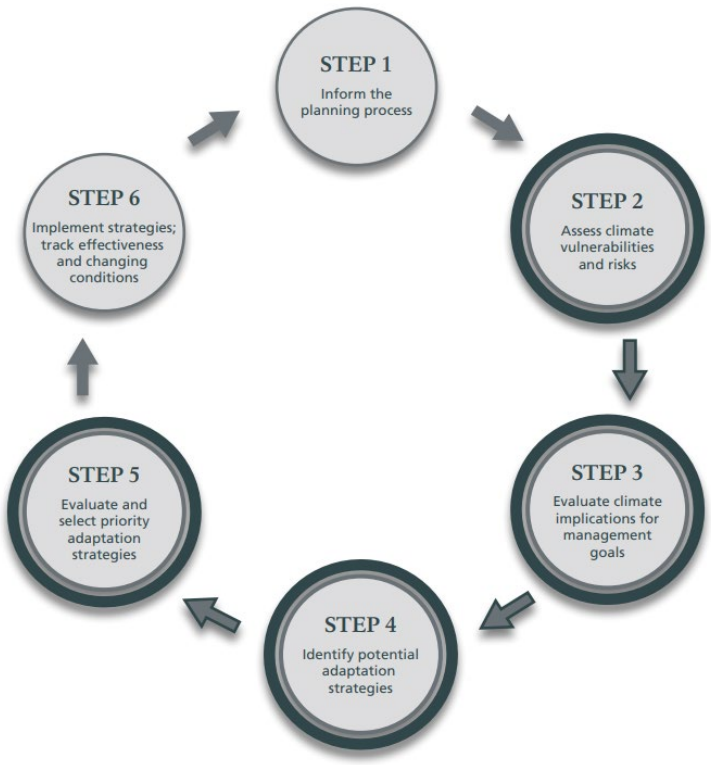

Figure 2. Generalized NPS Adaptation Planning Process. The concentric circles of Steps 2 through 5 represent multiple scenarios for consideration.

The essence of the process is simple. Regardless of the type of plan, planners and managers should ask the following:

- What is the range of climate projections for my area?
- If the climate changes according to the climate projections, what are the likely effects on and risks to resources or assets that are the focus of this planning effort?

- Are these risks consequential; do they matter to the purpose of this plan?
- If so, what strategies and actions could mitigate these risks?
- Do I need to modify my goals and are they attainable?

The steps in the process build on and draw from one another. It is an iterative process, thus documenting information, assumptions, and decisions in each step can support future refinements based on new information or changing conditions or assumptions.

STEP 1

Inform the planning process. In Step 1, as part of preliminary project planning, planners and managers specify which park resources, assets, or values are the focus of the planning effort; clarify existing management goals related to those features; define the spatial and temporal scope of the planning; begin engaging with key internal and external participants; and compile relevant context and background information.

STEP 2

Assess climate vulnerabilities and risks. Step 2 focuses on projecting future conditions and assessing how those changes may affect the park, specifically the focus of the plan defined in Step 1. Here, planners and managers identify projected future climatic and other conditions, and consider which resources and assets are most vulnerable to those changes and the reasons for those vulnerabilities. This is the basis for identifying which impacts and vulnerabilities pose the greatest risks to sustaining the park's mission and achieving its management goals.

STEP 3

Evaluate climate implications for management goals. Step 3 focuses on evaluating whether current management goals will continue to be feasible and relevant in light of expected changes. Planners then consider if and how goals may need to be refined, updated, or perhaps replaced to provide climate-informed goals.

STEP 4

Identify potential adaptation strategies. In Step 4, planners and managers focus on identifying the broadest array of possible strategies to address climate vulnerabilities and risks. This is the stage in the planning process for creativity and innovation, including consideration of approaches that may not be immediately actionable, but could become more viable as the impacts of climate change accelerate.

STEP 5

Evaluate and select priority adaptation strategies. Step 5 focuses on distilling the full array of possible adaptation responses (from Step 4) into strategies that best achieve the park's climate-informed goals. To do so, planners and managers evaluate and select strategies based on longer-term adaptation needs and near-term implementation considerations, including technical feasibility as well as legal, financial, or social constraints and opportunities. Commensurate with park goals,

selected strategies will reflect a decision to either resist, accept, or work to direct the trajectory of climate change effects toward more desirable conditions.

STEP 6

Implement strategies; track effectiveness and changing conditions. Step 6 entails implementing the plan and monitoring the results of adaptation efforts to ensure that strategies and actions provide the desired effect. Monitoring results can help park managers identify any necessary changes in tactics. The design of monitoring and evaluation must accommodate immediate needs of the park while also considering changing environmental conditions, future projections, and novel and unexpected circumstances that may arise from climate change.

((NPS), 2021)

Climate Change Adaptation Approaches

This figure describes a matrix NPS uses to categorize climate change adaptation approaches for a National Park.

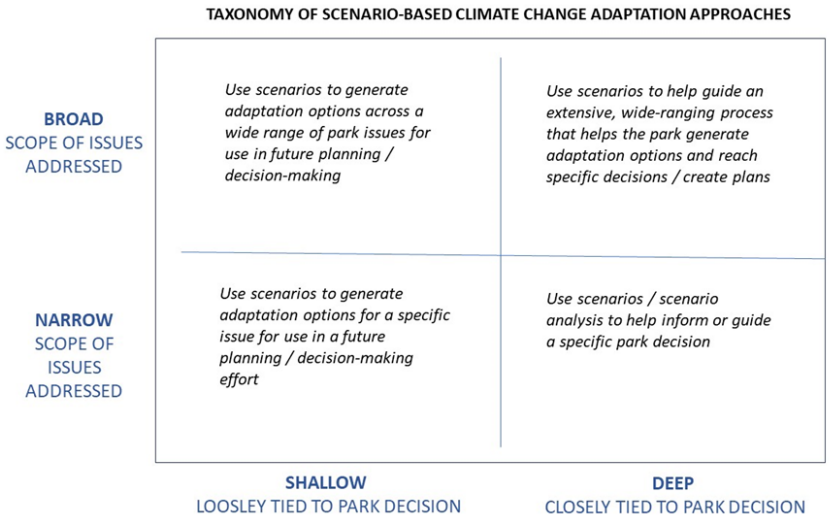

Figure 3: NPS Climate Change Response Program scenario-based climate change adaptation approaches can be organized according to breadth of scope (i.e., narrow [few issues addressed] or broad) and whether the desired process is simply an exploration of options or is intended to guide a specific decision or set of decisions.

The matrix distinguishes scenario-based adaptation approaches in part by the scope of issues addressed (y-axis). When a park looks to use scenarios to help with climate change adaptation, this distinction determines whether the scope of the assistance addresses a broad range of issues within the park (e.g., assessing how climate might affect visitation, facilities and natural/cultural resources to inform a wide range of park issues) or a more narrow set of issues (where the park is focused on a particular aspect of its work – e.g., a grazing management plan or a decision regarding a specific piece of infrastructure). The second distinction is based around what the assistance is used for (x-axis). Is the scenario work intended to mostly generate ideas and adaptation options (i.e., so that it is loosely tied to park planning or decision making) or is the work intended to specifically inform one or more decisions (i.e., so that it is tightly connected to park planning or decision making)? An option generation focus will typically involve activities in the early stages of a management process, while a decision focus will involve activities throughout or in the latter stages of a management process.

The resulting quadrants frame four possible combinations of scope and decision type.

EXPECTED OUTPUT OF THE UPPER LEFT QUADRANT

• Identification of adaptation strategies that the park should consider as part of forthcoming planning/strategy development processes.

• Recognition of new perspectives or concerns that should be included and addressed.

• Identification of any new information/data requirements.

• Identification of any aspects of the focal issue or resource that need clarification or further study/discussion.

• Potential for improved collaboration drawn from joint participation in workshops.

• Scenarios that provide a new insight into possible futures, and a framework for communicating and engaging with others.

• A group of people who are energized and excited to apply this process in more detail to specific resources/issues in the park.

METHODOLOGIES & TOOLS IN THE UPPER LEFT QUADRANT

This quadrant contains the greatest variety of scenario offerings. It covers a range of methods including training and participatory approaches to climate-smart conservation. Pre-workshop trainings are most prevalent in this quadrant, attached to broad pre-planning and early development of climate change inclusion in planning processes.

(National Park Service Climate Change Response Team, 2024)

Scenario planning

Analyzing and understanding the future environment is necessary when the aim is to plan for long term decisions. The macro-environment consists of broad environmental factors that impact many organizations. PESTEL is a key tool for analyzing the broad macro-environment of an organization. PESTEL factors examine macro-environmental factors according to six key types: political, economic, social, technological, ecological and legal. Ecological macro environmental factors such as for example climate change are impacting a wide range of activities from tourism, agriculture, to nature conservation. The fundamental purpose of a macro environmental analysis like PESTEL is to aim at identifying the key drivers of change. Key drivers of change are the environmental factors likely to have high impact on different sectors, and the success or failure of strategies within them. It is important that an organization's strategist consider key drivers of change, looking to minimize threats and where possible, seize opportunities.

Scenario analysis is a technique that develops plausible alternative views of how the environment might develop in the future. Scenario analysis differs from forecasting because it avoids predictions about the future; it is more about learning about different possible futures. Scenarios are alternative possible environments that strategies must deal with. Scenarios are means for challenging the fundamental and often implicit assumptions managers have about the future. Scenarios offer plausible alternative views of how the macro-environment might develop in the future, typically in the long term. Scenarios are not strategies in themselves, but alternative possible environments that strategists must deal with. Scenario analysis should raise the possibility of radical and discontinues change. Scenario analysis is typically used in conditions of high uncertainty, where change in environment could go in several highly distinct directions.

(Whittington, Angwin, Regnér, Johnson, & Scholes, 2023)

Figure 4: Forecast planning (depicted on the left) entails planning for one predicted future (typically within an acceptable margin of error). Such planning is most appropriate when there are aspects of the future that are controllable and considered likely. Scenario planning (depicted on the right) considers multiple potential futures as plausible. Scenarios build on what is known but also consider inherent unpredictability of complex systems.

Broadly speaking, scenarios are descriptions of plausible, alternative future conditions. Thinking through multiple scenarios is a useful approach to support planning and decisions despite imperfect information about future conditions.

For climate adaptation, it is especially useful to consider multiple scenarios in the following situations:

- when the context is dynamic and uncertain,
- when developing a mid- to long-term (5+ to 7+ years) strategy or plan,
- when considering a large capital investment,
- when making a decision with potentially long term or irreversible consequences, and/or
- when the goal is for long-term sustainability for the product of the planning effort

Scenario planning can inform a range of possible management options. In some cases, it may be constructive to identify robust strategies that would be effective no matter which conditions unfold in the future. Considering multiple scenarios can also help parks proactively develop strategies to respond quickly when surprises occur. This might include putting contingencies in place to prepare for a potentially catastrophic event.

((NPS), 2021)

Scenario planners usually avoid presenting alternatives in term of finely calculated probabilities, because scenarios tend to extend far into the future to allow probability calculations. The point of scenarios is more to

learn than to predict and are used to explore the way environmental factors inter-relate, and to help keep managers minds open.

There are many ways to carry out scenario analyses, even if the process often follows a few basic predetermined steps:

- *Defining scenario scope* refers to the subject of the scenario analysis and the time span. The appropriate time span is determined partly by the expected life of investments.
- *Identifying the key drivers of change*. The definitions of the key drivers of change are affected of variables like impact, uncertainty and divergence. Key drivers are typically identified by research involving media sources, analysis of external reports, consultations with internal and external experts, consultations with suppliers and customers, and hiring of consultants.
- *Developing scenario stories*. As in films, scenarios are basically stories. Having selected opposing key drivers of change, it is necessary to knit together plausible stories that incorporate both key drivers and other factors into a coherent whole. These stories are often encapsulated with striking titles.
- *Identifying impacts of alternative scenarios.* It is important for an organization to carry out robustness checks in the face of the face of each plausible scenario and to adapt strategies that appear vulnerable and develop contingency plans in case they happen.
- *Monitor progress*. Organizations should monitor progress over time, to alert themselves to wheatear and how development actually fits scenario expectations. It is important to identify indicators that might give early warning about the direction of environmental change and set up system to monitor these.

(Whittington, Angwin, Regnér, Johnson, & Scholes, 2023)

The Abisko Pilot Process

The Abisko climate change adaptation planning pilot was performed between autumn 2024 and spring 2025. During 2024, the pilot consisted of internal work within the CLAP project team at the County Administrative Board of Norrbotten, together with parallel exchange of information between all project pilots and cooperation with NPS. The external workshops were held in February and March 2025. All steps were completed in an iterative learning process where the work was tested and evaluated along the way.

Step 1 – inform the planning process

Focus question, scope, focus areas and clarifying existing goals

- Decide focus and scope of the planning effort
- Clarify existing management goals
- Compile relevant context and background information
- Begin engaging with key internal and external participants

The timeframe and the geographical scope of the planning was internally defined; this emerged in internal meetings during the autumn and winter of 2024.

The time horizon for the planning effort was set at 25 years. One reason for this is that many facility resources have this lifespan, even though certain assets in the park are managed in the longer term, such as habitats, species and bridges. It is also reasonable that both a new management plan for Abisko has been produced and that this needs a further review or update within this time frame. Planning for a longer term than 25 years can be difficult to grasp for those involved.

The geographical scope was set at park wide because this is where the management assignment extends. However, it was not an easy decision because many resources are affected by events outside the national park boundaries.

The focus question for the planning efforts was set as a part of the internal work in the CLAP project, and was formulated as follows:

“How can climate change together with other factors shape the future in Abisko National Park in 25 years from now to 2050?

The focus question expresses both the geographic scope and the time scope of the planning effort.

The focus areas of the planning effort were decided to be Nature Resources, Facilities and Visitor use and experience. The process of creation a new management plan was in an early stage, because of that a broad focus was suitable.

At an early stage, contact was made with key stakeholders such as Gabna Sami Community, the Swedish Tourist Association, Abisko Scientific Research Station, and Naturum Abisko. The questions addressed to these stakeholders concerned mapping of land use, visitor statistics, visitor behaviors, and inquiries about current research being conducted.

Relevant materials, such as the management plan for the National Park, the conservation plan for the Natura 2000 area, and the Swedish Environmental Protection Agency’s guidelines for the management of state hiking trails in the mountains, were reviewed to prepare the planning process. In these documents many of the existing management goals and guidelines were defined.

Choosing Adaptation Approach

Important factors influencing the choice of approach for each park is in short: how many resources the park wants to include in the process, how in-depth they want to go on identifying adaptation options for those resources, staff capacity, project/funding timelines, the availability of relevant climate projections (affects how quickly pilot parks can get started).

Abisko planning effort was placed in the upper left quadrant in the matrix for the different planning approaches, since the goal of the process was:

Informing the conversation around climate change adaptation for a broad set of resources and management focus areas, to inform a pre-planning process and generate ideas and options that could be used in future planning and decision making.

The park management wanted to explore how they should address climate change concerns. There was no expectation that the scenario work would immediately result in decisions or plans, but resulting adaptation options could be considered in future planning or decision-making efforts. The goal

was also to train staff and partners in scenario-based climate adaptation planning more broadly.

The management plan for the National Park is relatively old (1992) and needs an update. But the process of updating it had not officially started so at this early stage of that process it was suitable to make a first planning effort with a broad scope of issues, loosely tied to park decisions.

Climate Futures Analysis

To inform the planning process about future climate change in Abisko National Park, CABN ordered a climate analysis from the Swedish Meteorological and Hydrological Institute (SMHI)

Since it was difficult to define in advance which specific metrics would be most relevant for the selected resources rather general metrics was chosen focusing on temperature and precipitation. Prior to placing the order, meetings were held with SMHI to jointly clarify the scope of the request. From the time of the order, it took SMHI two months to produce the climate report. The cost of producing the climate analysis was SEK 43,000.

The climate analysis report describes the future climate in Abisko regarding several climate indicators, presented in graphs together with descriptive texts. The analyses use two RCP (Representative Concentration Pathways) scenarios, RCP4.5, which is based on limited emissions, and RCP8.5, with high emissions.

The RCP: s is developed by the IPCC (Intergovernmental Panel on Climate Change). Each RCP represents a projection based on assumptions of the levels of emissions, corresponding to a particular concentration of greenhouse gases in the atmosphere.

The IPCC has also defined five Shared Socioeconomic Pathways (SSPs), which may at times replace or complement the RCPs in climate analyses. However, the SSPs were not applied in the climate analysis for Abisko National Park.

Climate models make calculations in so-called grid squares. SMHI: s scenario service uses 12 x 12 km grid squares, which means that one square cover almost the entire Park. The most representative square was selected for the analysis.

For each climate indicator, results were presented with average values over 30-year periods, one historical and three future periods.

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An example of the results from the Climate Future Scenario describing a Climate Indicator

Annual mean temperature is an average of each year's daily mean temperatures. It describes the overall climate at a location, and changes can be compared to changes in the global mean temperature.

During the reference period 1971-2000, the annual mean temperature in Abisko was approximately -2.8 °C. The bars in Figure 2 show that the temperature will gradually increase in the future and the trend towards warmer temperatures is clear in both RCP4.5 (blue bars) and RCP8.5 (red bars). The standard deviation increases until the end of the century, which means that the uncertainty in the results is greater here. Both scenarios show plus degrees, approximately 0.3 °C according to RCP4.5 and 2.1 °C according to RCP8.5. This corresponds approximately to a temperature climate during the reference period in Boden and Umeå, respectively. The increase according to RCP8.5 is 4.9 degrees.

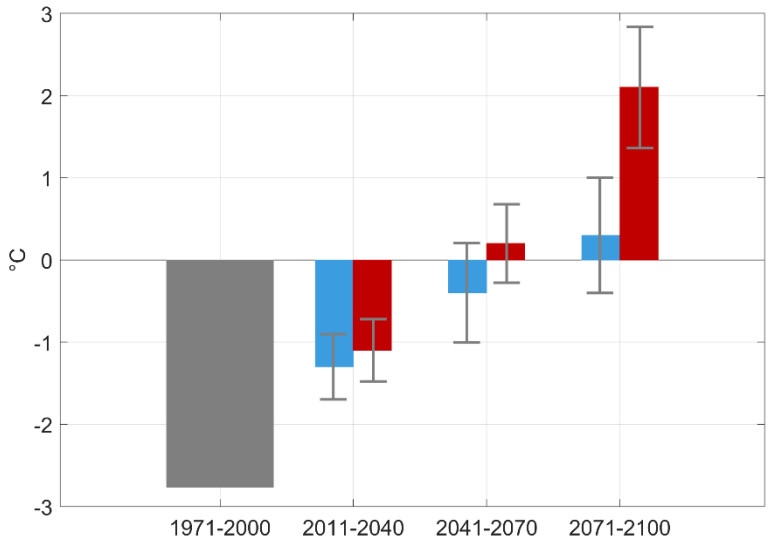

Figure 5: Annual mean temperature in Abisko, observed for the period 1971-2000 and projected for the periods 2011-2040, 2041-2070 and 2071-2100 according to RCP4.5 (blue bars) and RCP8.5 (red bars). The standard deviation of the climate scenarios is shown as brackets around the bar value.

(Sjökvist, 2024)

In the Abisko climate adaptation planning process, two climate futures were chosen as plausible but divergent possibilities. They were characterized as

RCP 4,5 2011-2040 and RCP 8,5 2041-2070. The main features of each climate future are outlined in a comparative table in Appendix 1 “Climate future tables”.

Lessons learned Step 1

During Step 1, the working group encountered several challenges in applying the NPS method. One major issue was the lack of easily accessible scientific data on threshold values for various resources—data that could indicate tipping points for biological and ecological systems. It was unclear which climate metrics had the greatest impact on each resource in ANP. But because the approach was broad it was decided that it could work out with general metrics in this planning effort.

Another difficulty was the inability to generate divergent climate scenarios within the project's budget and timeframe. SMHI, which was commissioned by the County Administrative Board to conduct the climate analysis, used a different way than how is typically done in the United States. As a result, instead of producing two distinctly different climate futures, the scenarios ended up being variations of “more or less the same.” This, in turn, led to additional insights later in the pilot process.

Another work was the lack of an accessible description of the process for updating a management plan in a Swedish national park. A detailed description of this process could have supported the implementation of the NPS planning method.

Step 2 – Assess Climate Vulnerabilities and Risks

- Identify projected climate futures and other conditions
- Consider vulnerabilities of the park´s assets to those changes
- Identify the greatest risks to the park´s mission and management goals

During step 2, vulnerability assessments were made in two external workshops with stakeholders and one internal workshop within the CLAP team.

The first external workshop was during a physical meeting with stakeholders, that was held in person in Abisko with the “National Park Council”. The National Park Council is a yearly meeting for stakeholders

with interests of how the management of the National Park is done. It is an opportunity for the participants to share information and opinions. The people that were invited were a mix including persons from different units in the CABN working with the National Park, entrepreneurs in the surrounding area, the Sami community, the municipality and other organizations. After the ordinary meeting session, the participants were invited for lunch, followed by a 2-hour long workshop with "climate theme". The purpose of the session was to inform the planning process about which effects of climate change that already could be seen in the ANP, and in addition identify possible drivers of change in the future.

A presentation was held about the CLAP project, followed by general information about climate change and the impacts so far. Participants were given information from the climate analysis for Abisko National Park, produced by SMHI.

A discussion about what changes the participants have seen so far was held. The result of that discussion is found in Appendix 2 "Step 2 Changes seen in ANP".

The National Park Council then were asked "What environmental factors do you think will drive change in Abisko National Park and its surrounding area in the future?" They were instructed to start the discussion from their own perspective. In beforehand they were informed with a few examples of climate and non-climate drivers of change that the management believe will affect the future as examples:

- Size of financial allocation
- Visitor numbers
- Visitor use
- Amount of snow
- Winter temperatures

Participants worked together in small groups with the task to identify +20 different drivers of change, which then was presented and discussed.

Examples of drivers of change identified by the participants:

- Coolcation trend
- Precipitation
- Warmer weather
- Less bare mountain
- Invasive Species

The complete list of brainstormed drivers of change can be found in Appendix 3 “Drivers of Change”.

Photo from the National Park Council Climate Change Adaptation Workshop in naturum Abisko Visitor Center, Abisko National Park, February 2025.

Scenario Building Blocks

For the second workshop the purpose was to create a Scenario framework. The scenario framework was meant to be a central part in the discussion for the final and last workshop.

The scenario framework was created in an internal workshop with participants from the CLAP team. From the first workshop with the National Park Council, the CLAP team had a gross list of potential drivers of change to work with. Any list of driving forces can typically be categorized into three buckets:

- Pre-determined Elements: forces that are ‘locked-in’ and confidently predictable over the next ~25 years
- Critical Uncertainties: important forces that have the potential to move in alternative directions over the next ~25 years
- Wildcards: high impact (and often low probability) events and developments that could impact the future in significant ways over the next ~25 years

(Climate Change Scenario Planning Workshop Report St. Croix National Scenic Riverway, 2023)

The CLAP team had internal online meetings with five participants, using a digital tool called “Miro board”. The meeting included following discussions:

- Complementary brainstorming exercise to list more drivers of change.
- Dividing drivers of change into the three different categories: pre-determined, critical Uncertainties and wildcards.
- Identify several *critical uncertainties* as candidates for axes in the development of a scenario framework. These are expressed as two-sided arrows, which is a necessary simplification for the creation of a basic scenario framework.

The following are examples of considered critical uncertainties:

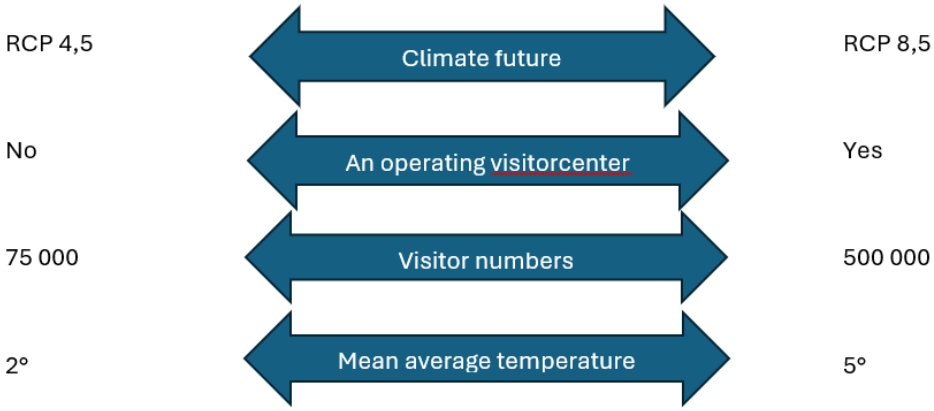

Figure 6. Examples of critical uncertainties.

Scenario Framework

A scenario framework was created by combining two different axes in a 2 x 2 framework. This construction created 4 quadrants, and hence 4 different sets of conditions (scenarios) that might be realized in the future. Because a perfect framework doesn’t exist, the exercise involved trying out combinations, and testing which created the most promising set of scenarios. Discussions were held whether or not the created scenarios had the following desired characteristics:

- *Plausible*: each scenario has the potential to occur in some form (even if the assessed probability is low)
- *Challenging*: each scenario includes some logic or development that puts pressure on some aspect of the ‘conventional wisdom’
- *Relevant*: each scenario provides relevant implications for the ‘management challenges, outlined in earlier phases

- *Memorable*: the main concept behind each scenario is powerful and relatively easy to communicate
- *Divergent*: each scenario is different from the others, which helps acknowledge uncertainty and stretch thinking in different directions

(Climate Change Scenario Planning Workshop Report St. Croix National Scenic Riverway, 2023)

As a result of these discussions, the CLAP team settled on a matrix that combined climate conditions with visitor use, as follows:

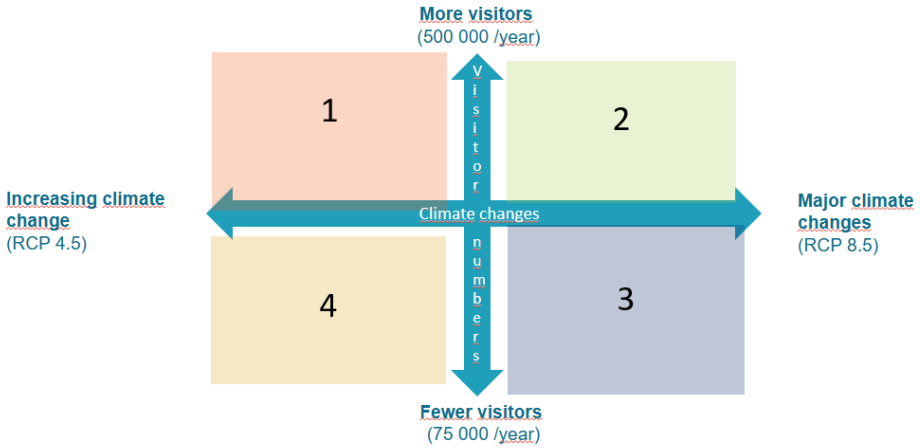

Figure 7: The Scenario Framework used in the Two-day workshop in Abisko National Park.

The Final Two-day Workshop

The planning process concluded with a two-day, in-person workshop during which steps 2–5 in the planning process were carried out. The aim of the workshop was to explore the four scenarios in greater depth, gain a better understanding of their potential impacts, and subsequently brainstorm possible adaptation activities and prioritize among them.

In planning the event, CABN received strong support from the NPS through regular coordination meetings and by accessing documentation from similar workshops. Particularly helpful was the Climate Change Scenario Planning Workshop Report from the work with St. Croix National Scenic Riverway conducted by the NPS in 2023. Weekly internal online meetings were also held to prepare for the workshop.

Participants in the two-day in-person workshop included staff from CABN, including the CLAP team, three representatives from the Swedish Environmental Protection Agency, and a researcher from the Climate Impacts Research Centre at Umeå University. In total, about 20 people participated in the workshop.

Photo of participants in the Two-day Workshop in Abisko, March 2025. Photo: CABN.

The workshop took place at the Abisko Nature Visitor Centre “Naturum,” located in the heart of Abisko National Park.

To prepare participants, a 1.5-hour pre-webinar was held online, providing information about the CLAP project, the climate analysis, and scenario planning in general. The session also included time for questions.

Details of the workshop’s schedule and design can be found in Appendix 4, “Abisko Workshop Design.”

The workshop was designed with the following objectives in mind:

1. To generate ideas and adaptation options for consideration and inclusion in a future updated Management Plan for Abisko National Park.
2. To develop an understanding of how to integrate climate change considerations into planning and management at CABN, focusing on testing scenario planning and implementing Steps 2–5 of the NPS adaptation planning method.

Building out Scenarios

The first exercise in the final workshop was to further develop each scenario quadrant, with the purpose of setting the scene for the subsequent discussions. This involved creative storytelling (to ensure that the scenarios were memorable) and identifying relevant implications for the various management challenges within the three focus areas: facilities, natural resources, and visitor use and experience.

As input for the scenario development, three workshop participants provided information about the challenges related to each of the focus areas:

Eva Oskarsson, the nature manager of ANP, gave an overview of the *facilities* within the park. Eva also talked about how they tried to work with maintenance with as little environmental impact as possible.

Future challenges included:

- Damage from ATV: s causing erosion
- Not being able to use suitable winter trails due to unsafe conditions
- Trampling that occur because of hikers during the fallow period
- Impact of flooding on tent places
- Ice drifts next to the canyon causing safety issues
- Violations of barriers
- Clearing of fallen trees due to moth infestation
- Planning difficulties as the weather has become unpredictable

Lo Fischer, nature center manager, spoke about *the visitor's perspective*. The area has a long history of visitor tourism: developed after the construction of the railway for transporting iron ore, then the first tourist station was added, and then the national park was established in 1909 as one of the first in Europe.

Today's visitor numbers are estimated at 150,000 per year in the national park and 50,000 per year in the Naturum visitor center.

Visitor trends have shifted from nature enthusiasts on longer hikes to today's tourists; which consists of an increasing number of people from metropolitan areas in other countries with little experience of being in nature, who come all year round for a shorter period and move across a smaller area. There has been an increase in the number of tourist companies and overnight accommodation options in the area. The limiting factor preventing the number of visitors or the number of guest nights from increasing to a greater extent is the limitation of overnight accommodation

options. There is a growing interest in polar winter, darkness, silence and the northern lights.

Emily Pickering Pedersen, a scientist at the Climate Impacts Research Center provided the group with information about research on the consequences from climate changes on the arctic environment and the *natural resources* in ANP. The research is performed by observations, experiments, monitoring and modelling. It is not easy to understand how the ecosystems works and changes, because they are very complex, biodiversity is not affected only in one way, the results are not unambiguous and depend on context and chosen method. The better we understand how ecosystems work, the better we can understand changes within an ecosystem. Arctic ecosystems are resilient, but tipping points can cause dramatic and unexpected changes.

General ecosystem changes in the Arctic:

- Thawing permafrost
- Melting glaciers
- Increasing carbon emissions
- Seasons changes
- Extreme weather events (heavy rainfall, rain on snow events, drought, forest fire)

Vegetation changes in a warmer climate:

- Vegetation increases
- Greening and bushing
- Trees and tall bushes become denser
- Shrubs invade open areas
- Changing microclimates
- Reduced diversity
- Frost damage and drought
- Increasing frequency of insect outbreaks
- Lichens and mosses are particularly vulnerable
- The tree line is moving upwards due to warming and reduced grazing
- Change in vegetation changes the environment for herbivores
- Risk that invasive species establish

Following the presentations, participants were divided into three breakout groups, focusing on one scenario quadrant each. The groups were intentionally composed of members with different backgrounds and areas of expertise to ensure a diversity of perspectives. The number of

participants limited the total to three breakout groups; therefore, the fourth scenario was pre-populated in advance by the CLAP team.

Each breakout group had a dedicated facilitator from the CLAP team, that was already familiar with the exercises. The working material consisted of big paper sheets and Post-it notes. As background material a comparative table of the different climate futures was provided.

Each scenario was developed by first brainstorming potential events and effects that could occur under the given conditions over the next 25 years. The CLAP team had pre-populated each scenario with one extreme event that could serve as a potential tipping point (e.g., fire, war, flood, or Visitor Centre closure). These events were arranged along a timeline spanning from 2025 to 2050. The groups then identified possible challenges and opportunities that might arise within each scenario.

The scenario development exercise concluded with each group creating a narrative and a title for their scenario. The narratives could take the form of a written story, media headlines, or a short role-play.

Full transcriptions of the worksheet notes are provided in Appendix 5, “Step 2.”

The following section presents a summary of key highlights from each scenario.

Descriptions of the Scenarios

Scenario 1 – Visitor record became visitor collapse (top-left)

Scenario with 500 000 visitors yearly and moderate changing climate (RCP 4,5)

In this scenario we foresee a lot of changes, many of them occurring due to the raised number of visitors in combination with a warmer and wetter climate.

Significant soil degradation is expected. Trails will become moist and muddy. Wear and tear on nature and hiking trails will increase. Numerous slipping accidents may occur; shoes with spikes contribute to ground erosion. Damage from trampling and the creation of new informal trails near populated areas are anticipated. An increase in mosquitoes may lead to fewer visitors in June. Overcrowding on trails and at rest areas will become more common. Changes in visitor patterns throughout the year are expected due to lack of space and/or climate change. Visitors will be present year-round. Toilets will overflow. There will be a general need for enhanced management. And the management efforts in general needs to be strengthened.

Flooding will occur. Ecosystem changes will continue, including shrub encroachment and shifts in biodiversity. Threatened species will be negatively affected by climate change, and increased visitor pressure will further stress these species. Warmer, more polluted water will threaten both flora and fauna. A higher number of visitors increases the risk of introducing invasive species, which may thrive due to climate change. Invasive species will enter the area, potentially displacing others.

This is what we expect can be a true story, an example from the news in February 2050:

Visitor record became visitor collapse. The number of collapses in Abisko are many. It's not only the number of visitors that has collapsed; today we also see that facilities have been affected and not maintained in time, with around twenty damaged beam bridges reported. The wastewater treatment plant, which discharges greywater into the park, couldn't handle the influx of people and was forced to release untreated sewage, which led to raspberries and nettles taking over the dry heaths north of the treatment plant. The County Administrative Board's paving of large areas in the vicinity is believed to have greatly amplified the consequences of last year's flooding.

Scenario 2 – Hot and Crowded (Top-right)

In this scenario the number of visitors increases, from about 150, 000 (today´s approximated number) to 500, 000 (more than double of today´s number) and the climate changes are substantial (RCP 8,5) - it will become hotter and wetter. The prepopulated extrem event was a wildfire occurring after a dry period in summer and caused by visitors making a fire where it is not allowed, and this was placed on the timeline around year 2030. Before that event, high flows in the rivers caused bridges to collapse. The warmer climate also reduces both the thickness of the snow cover and the period when snow covers the ground.

After the wildfire occurred the number of visitors continued to increase which, in combination with extreme precipitation in summer, causes huge problems with erosion and wear and tear on and beside trails. There will be a need for more facilities, and they will require more maintenance because of the effects of climate change. For instance, the tent site becomes overcrowded and visitors camp illegally. The increasingly uncertain snow conditions mean that winter trails must be closed. The warming climate also leads to changes in alpine ecosystems. Permafrost and persistent snowfields will disappear. Alpine and subalpine heaths and grasslands will decrease while becoming increasingly bushy. Arctic species will be at risk of disappearing from the national park.

Scenario 3 – The Last Skier (Bottom-right)

In this scenario the number of visitors in Abisko National Park decreases, from about 150 000 to 75 000, and the climate changes are substantial (RCP 8,5). The warming climate and longer vegetation period lead to denser

vegetation higher trees, and increased forage for moose & reindeers. New invasive species move into the area. Some species are lost as they cannot climb higher up the mountain, loose their habitat, or are outcompeted. For visitors, there are often unsafe conditions along trails and bridges, due to regular floodings and icy or slippery wet ground. The winter season is no longer attractive to visitors due to lack of snow and often cloudy skies, which also leads to fewer Northern lights tourists. Fewer visitors mean reduced funding for the visitor Centre, and in turn less information for tourists and less staff and maintenance in the park. However, it also means less wear & tear, less need to adapt facilities and less disturbance on wildlife.

A war takes place in Europe from the year 2040 which is an extreme event, giving rise to a small rise in visitors in the area since some people flee to North Scandinavia. At the same time, there is an increase in defense activities and a mining expansion in the surrounding Abisko area. Reindeers move into the national park to graze, as there are hardly any other places to go. The mining industry funds park management and an expansion of the size of the park, as a compensation measure for its expansion. This results in infrastructure investments in the park, such as short, paved trails, quad bike trails and drone trails, suitable for most visitors who tend to prefer walking shorter distances. Nearer 2050, conflict and instability hit North Scandinavia, leading to heavy military activities in Abisko and a drop in visitors. Defense is prioritized over other interests, even affecting the park with military logistics and disturbance. Visits are strongly restricted in the park, and it temporarily has to close.

Scenario 4 – Wet, Boring and Warn out (Bottom-left)

In this scenario the number of visitors decreases, from about 150, 000 (today´s approximated number) to 75, 000 (half of today´s number) and the climate changes are moderate (RCP 4,5). The wild-card event was the closure of the Visitor Center naturum Abisko and this was placed on the timeline around year 2040. Before that event, wear on trails and less snow and ice together with more rain and clouds led to less visitors. Fewer visitors allow nature to recover and reindeer to be undisturbed, but climate effects on nature lead to lower quality of water, reduction of Arctic species and ecosystem changes. Fewer visitors also means that some trails can be removed, but the facilities that are left require more maintenance because of climate effects. When the Visitor Center has closed, visitor´s competence decreases and less people know how to act, rules are not followed and dangerous behavior increases, leading to increased risk of forest fires, accidents and other negative effects.

Lessons Learned from Step 2

Before the scenario-building exercise, it's useful to have a brief description of the climate scenarios to distinguish between them. The presentation of climate scenarios can be improved by making them descriptive, clarifying

the climate information and differences, and ensuring they are divergent. Including prepopulated ecosystem tipping points or "extreme events" can help account for sudden events that might cause significant shifts.

The different RCP scenarios can be summarized in bullet form with clear climate data and differences, possibly with short descriptive titles. Although the comparative table of RCP climate scenarios for Abisko NP was good, participants still mixed them up. Clear, short descriptions of the main differences would have helped during the scenario-building exercises.

Working with scenarios was rewarding and appreciated. Presenting scenarios as narratives, such as in a theater format, can be an effective way to remember them. However, several participants felt there was too little time for the exercises, including brainstorming possible effects/events and discussing challenges and opportunities.

A challenge is the process by involving diverse actors and engaging external stakeholders like visitor organizations and the Sami communities. A suggestion is to identify key stakeholders and tailor invitations in smaller meetings and workshops with more narrow themes relevant to their interests. Invite them to discuss themes that concern them. Develop targeted outreach strategies and thematic sessions to engage a wider audience. Involving a broader range of stakeholders, such as local communities, businesses, and other organizations, can help broaden the conversation and foster collaborative efforts in climate adaptation.

Step 3 – Goal discussions

To evaluate the current goals related to the selected focus areas, a dedicated discussion was held. Participants were divided into groups according to their expertise and specialized knowledge of the focus areas.

The existing goals were primarily sourced from the current management plan, the conservation plan for the Natura 2000 area, and the Swedish Environmental Protection Agency’s guidelines for managing state hiking trails in the mountain regions. The group facilitators had prepared the goals for discussion in advance.

The task was to assess whether the current goals are being achieved and to discuss their future realism and how they might be influenced by various possible scenarios. The purpose was to raise awareness of and clarify existing goals. This ensures that all participants have a shared understanding and can work towards the same objectives.

Assessment of Current Goals started with Reviewing of the current concepts, goals, guidelines, and objectives in the governing documents. The

group noted down whether these goals are being achieved today. A discussion was held whether the current goals are still realistic and relevant for the future. An open discussion about how different future scenarios might affect the ability to achieve these goals.

Questions discussed:

- Is the goal clear and understandable or does it need to be clarified? How?
- How might future climate change, changing visitor numbers, and other events/effects impact the goal?
- Does the goal need to be broken down into sub-goals?
- Is the goal timed?
- What obstacles are there to achieving the goal?
- What needs to be investigated further?
- Other questions and concerns?
- What goals are we missing?

The tables used and the results from the goal discussions can be found in appendix 6 “Step 3 Goal Evaluation”.

A dedicated conversation about goals for Natural resources. Photo from the Two-day Workshop in Abisko, March 2025. Photo: CABN.

Lessons Learned from Step 3

The design of the step 3 exercise can be tailored to the planning process stage, context, focus areas, and participants' familiarity with the goals. Instead of having participants assess current goal achievement, park managers can provide this assessment, followed by a group discussion on the feasibility of these goals under different climate scenarios. This goal discussion serves a pedagogical purpose, even if new goals are not formulated.

The task was clear and easy to understand, which led to productive discussions. However, it was challenging to keep the conversation focused on the goals, as many side topics emerged. Participants appreciated the opportunity to “think freely” and explore ideas beyond their usual perspectives.

Assessing goal achievement was difficult for participants who do not work directly in the park. Some felt that the exercise could have been shorter, as 40 minutes was perceived as too long. The lack of clarity in goals across different documents made the discussion challenging, but participants found it valuable to identify and acknowledge this issue.

Step 4 – Generate Adaptation Options

Groups were asked to brainstorm and identify a number of ideas for their management challenges that would be worth pursuing or considering as part of the Management plan process. The descriptive scenarios outlined above served as a foundation for the workshop's main objective: to assist participants in developing adaptation options for the management challenges in the three focus areas: visitation, facilities, and natural resources.

To prepare for this step in the planning process the participants watched a recorded presentation by Whylie Carr, a planning specialist from National Park Service explaining the how they have used the RAD framework and how tipping points can affect the values in the protected areas.

Initially, participants were given time to individually brainstorm ideas. Subsequently, they reconvened in the same groups as in step 3, with each group focusing on challenges for a specific management focus area. The group was encouraged to implement the RAD Framework with the purpose to produce a wide spectrum of adaptation options. Each group was tasked with identifying potential adaptation options suitable for each scenario.

Groups were encouraged to consider a broad range of conditions for the resources in the park. The full list of potential adaptation options created by each group is contained in Appendix 7 “Step 4-5".

Some examples from the results for each of the management challenge areas are recorded below in the 3 different focus areas:

Nature resources

- Expand the national park to include at least adjacent Natura 2000 areas, preferably an even larger area
- Extensive reindeer grazing in mountain birch forests and alpine tundra.
- Intensive reindeer/goat/sheep grazing directed to the tree line zone.
- Selective logging the mountain birch forest, especially in the zone closest to alpine tundra.

Facilities

- Guardrails at the canyon
- Reinforced/hardscaped trails and surfaces
- Adapt mount Njullá for more alpine/winter guests with the aim of keeping them concentrated to a smaller area
- Pave (asphalt) trails
- Closing the park during certain periods of the year to protect natural values, reduce wear and tear and increase safety for visitors

Visitor use and experience

- Consider runoff and avalanche risks outside the national park.
- Remove the bridge over Kårsafallet to limit access/erosion in Zone 1 (Pristine Zone).
- Rotational use of short trails for ecosystem recovery and visitor experience.
- Adopt a comprehensive tourism strategy for the entire area.

Lessons Learned from Step 4

Working with actions is a rewarding and important step for participants. In step 4, it's suitable to divide groups into focus areas (e.g., facilities, natural resources, visitor use, and experience). An initial discussion on relevant climate data for each focus area can help groups focus on specific data pertinent to their resources.

It's crucial to allocate time for presenting and discussing suggestions, as this enhances the quality of ideas. The initial RAD lecture was well-received and helped broaden brainstorming, though categorizing measures into R, A,

or D was challenging. Clarifying the need to link actions to specific scenarios can improve focus during brainstorming.

The Step 4 exercise effectively generated many adaptation measures. The "extreme events/tipping points" were not prominent in this step, but this did not significantly impact the process.

The allocated time (40 minutes) was adequate. Participants appreciated the concrete nature of the exercise and enjoyed working with actions.

Discussion about Adaptation actions for facilities during the Two-day workshop in Abisko, March 2025. Photo: CABN.

Step 5 – Prioritize the generated Adaptation Options

Following the brainstorming sessions for adaptation activity options, participants reviewed them in all scenarios to determine which adaptation options were prioritized. The purpose was to identify ideas that are viable across all or most scenarios, known as "robust" or "no regrets" actions that are sensible to pursue, no matter which scenario plays out in the future.

This step included a exercise with the aim to evaluate and rank the adaptation actions identified earlier. The evaluation criteria were Effectiveness and Feasibility, and they were each getting a score between 1

- 6. The group was encouraged to discuss each criterion to ensure shared understanding of their meaning and how to score.

The groups scored the adaptation actions for both criteria and wrote a short phrase explaining the score. The two scores for each measure were added to get a total score to rank the adaptation actions accordingly.

Finally, each group selected a few key ideas for their management challenges that should be considered for inclusion in the Management plan.

The full list of potential adaptation options including prioritizing is contained in Appendix 7 “Step 4-5".

Lessons Learned from Step 5

For a workshop exercise on step 5, ensure ample time and an effective method for evaluating adaptation actions and reaching conclusions. Conclusions should address which actions are most important, robust (applicable in all scenarios), conflicting or win-win for different focal resources, prevent worst-case scenarios, and can be pursued immediately.

Rating adaptation actions took considerable time, and no group had enough time to review all actions. Understanding and discussing the evaluation criteria also required time. Actions were evaluated against only one scenario, which may not be the best approach.

There was insufficient time in the large group presentation/discussion to address all important questions about the actions, such as conflicting actions for different focus areas, robustness, and immediate pursuit. More time for discussion would have been beneficial.

While this work can continue after the workshop, it lacks the support of all participants.

Final reflections from the Two-day Workshop

The final conversation invited all participants to reflect on the discussions and exercises from the two-day workshop. Reactions varied, with some focusing on the overall process, others on specific scenarios, and some ideas for future consideration.

Best Case / Worst Case Scenario

Participants were asked to judge the four scenarios based on which felt like the "best case" or most benign for the park, and which was the "worst case" or most potentially damaging:

Worst Case

"The Last Skier": Most participants considered this the worst-case scenario.

"Hot and Crowded": Voted the next worst-case scenario.

Both scenarios fell under the RCP 8.5 part of the framework, indicating severe climate impacts.

Best Case Scenario

Scenario 4: Chosen by most participants as the best-case scenario.

Scenario 1: Followed closely as the next best-case scenario.

Motives and Concerns

The evaluation of each scenario was influenced by how visitors were perceived in relation to the purpose of the National Park. There was a unanimous agreement that less climate change is preferable to more climate change.

Actions that can be done before the revision of the Management Plan

To ensure a smooth transition and effective update of the management plan, following actions can be considered:

Include new insights in ongoing maintenance work and consider implementing adaptation actions permitted under the existing management plan.

Use scenario planning to continuously improve climate adaptation strategies. Regularly review and update climate adaptation plans based on new research and feedback from stakeholders. Conduct workshops to discuss challenges, share best practices, and identify new opportunities for adaptation.

Incorporate all the relevant insights and discussions from the recent workshop into the work with the new management plan. This includes strategies for climate adaptation, visitor management, and stakeholder engagement.

Gather more knowledge and facts to support the management plan. For example, collect data on the potential relocation of the Nisson tent site.

Collect and analyze data on visitor numbers, trail usage, and visitor patterns. This information is crucial for planning and managing visitor impacts.

Conduct thorough analyses and risk assessments, such as evaluating the risk of avalanches, landslides and identifying other potential dangers. This helps in making informed decisions and preparing for possible challenges.

Identify and clarify the key questions that need to be addressed before jumping to solutions. This helps in understanding what needs improvement and what should be included in the new management plan

Review the historical changes and developments over the past 30 years to understand current needs and how they have evolved. This historical perspective can guide future planning for future needs.

Ensure the new management plan is flexible and can adapt to changing conditions. This includes building in mechanisms to handle different scenarios and emerging needs

Identify all stakeholders affected by the national park and develop a stakeholder analysis and communication plan. This ensures effective engagement and collaboration with all relevant parties

Keep the National Park Council active and engaged in climate adaptation issues.

Establishing a Climate Adaptation Council for Swedish nature could be beneficial for climate adaptation in protected areas. Form a council comprising experts, policymakers, Naturvårdsverket, Länsstyrelsen and community representatives to develop and oversee climate adaptation initiatives. This council can provide guidance, coordinate efforts, and ensure that adaptation measures are effectively implemented.

Reflections from participants after completing the Scenario Planning Process

Familiarity with the process is good. Going through the process again with prior knowledge would make it faster and more efficient. Documenting the process and key learnings to streamline future iterations makes it easier next time.

Participants *appreciated the physical meeting* over a digital one. It is important to prioritize in-person meetings to enhance engagement and collaboration.

It is good to be confronted with what can actually happen, even if it is difficult and challenging to stretch your thinking. Discussing climate change from different perspectives feeds new thoughts and ideas.

It was hard for participants to understand what the different RCPs 4.5 and 8.5 means while building up the scenarios. It would be beneficial to describe the effects more clearly. Simplify explanations of RCPs and focus on tangible impacts. It was difficult because the effects are sometimes non-concrete and diffuse to understand. Discussions can be linked to different parts of climate analysis and seasons. It was easier to understand what more or fewer visitors mean.

Scenarios can be built in a narrow framework to discuss more in depth certain parts of management related to specific resources and climate change. Specific climate metrics can be used to delve deeper into particular aspects of management and climate change.

Based on a broad scenario planning, further scenario planning needs can be identified. Broad scenario planning can highlight the need for more detailed planning. The initial broad scenarios can be used to identify areas requiring further, more focused scenario planning.

Opportunities for continued cooperation

Work with climate adaptation of state-owned trails in the ANP. Utilize the extra funds that are currently available for climate adaptation of trails and outdoor recreation. Develop and implement a comprehensive plan for climate adaptation of trails. This could include repairing, replacing, and rerouting trails to withstand higher peak flows and other climate impacts.

Leverage Naturum Abisko Visitor Center's role in educating visitors and promoting outdoor recreation. Enhance Visitor Center programs to raise awareness about climate change and its impacts on natural areas. This could involve interactive exhibits, guided tours, and educational workshops that highlight the importance of climate adaptation and conservation.

Important Partners for Future Management

The Sami community plays a crucial role, particularly in reindeer herding related to tourism. Their traditional knowledge and connection to the land are invaluable for sustainable management practices.

Collaboration with universities and research organizations can provide essential scientific insights and data to inform management decisions. This includes studying climate impacts, visitor behavior, and conservation strategies.

Engaging local communities ensures that management plans reflect the needs and values of those who live in and around the park. Their involvement can foster support and cooperation for conservation efforts.

Partnerships with local, national, and international tourist organizations can help promote sustainable tourism practices and enhance visitor experiences. These organizations can also assist in managing visitor flow and impacts.

Collaboration with Trafikverket (Swedish Transport Administration) is essential for infrastructure planning and maintenance, ensuring safe and efficient access to the park.

Activities from LKAB and other big industries can significantly impact the environment. Engaging with big companies can in the future maybe help economic interests with environmental conservation.

Compromises that will need to be made in the future

Events may force deviations from the management plan (can be avoided if the management plan is as flexible as possible). Events such as natural disasters or unexpected changes may force deviations from the management plan. Ensuring the plan is flexible can help adapt to these challenges.

Trade-offs between different kinds of values and resources. Balancing different values, such as conservation and economic prioritizing, is essential. Every action affects nature, and some natural values may be lost as the climate changes

Historically, there has been a desire to increase visitor numbers. However, managing visitor impacts on the environment may require limiting numbers or changing visitor management strategies.

As maintenance costs rise, there may be a need to remove or repurpose buildings or facilities to ensure sustainability and reduce expenses. Informed choices of what facilities can and cannot be discontinued.

Workshop Evaluations from Participants

After the two-day workshop all participants filled in an evaluation document to access their experience of the workshop. All participants agreed on that it was rewarding to participate and that the subject was relevant for their work. They also considered the presentations, the exercises and the group discussions educative.

The parts pointed out as especially great was the presentations, the workshop activities, the final conversation and the group discussions.

What could have further improved the experience for the participants was more familiarity to the process, to continue the conversations and go in more depth, more knowledge about the different climate futures and time for a visit outside the park. The thing that most participants wanted the most was more time.

Additional comments in the evaluation were that it was valuable to participate, that the theme was important and that there was a desire to continue the work.

Recommendations for Future Work in the Management Plan Process

Encourage the Swedish Environmental Protection Agency (Naturvårdsverket), which holds responsibility for the issue, to formally initiate the process of updating the management plan, thereby transitioning the work into an operational phase.

Describe the process of developing new management plans for national parks in Sweden, in order to effectively integrate climate adaptation into the planning framework.

Explore various approaches to scenario planning to better prepare for future climate-related challenges.

Conduct thematic planning efforts to delve deeper into the specific resources and values of the park. Propose supplementing the outcomes from the workshop with internal, subject-specific workshops to gain a more comprehensive understanding of the park's resources.

Use internal workshops within the County Administrative Board to concretize proposals for new climate-adapted management objectives for the national park. There is a need to clearly distinguish between purpose and goals by articulating expected outcomes, which can be broken down into sub-goals.

Develop a collaboration plan with the research community in connection with the creation of the new management plan. This includes closer engagement with researchers from the Abisko Scientific Research Station (ANS), Umeå University (UMU), and the Swedish Polar Research Secretariat.

Organize a public event in Abisko to illustrate the potential impacts of future climate change, making the concept of different climate futures more tangible and accessible to the public and other stakeholders.

Continue the work initiated in Step 5, which could not be completed during the workshop, through internal efforts to evaluate the proposed climate adaptation measures. This will help ensure a more complete outcome from the workshop.

Implement Step 6 of the NPS planning process, by carrying out a selection of climate adaptation actions that are permissible under the current management plan, followed by an evaluation of their effects.

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Appendix 1. Climate futures table

The table shows projected changes in climate metrics in two different scenarios for Abisko National Park 2041-2070. Change values are the difference between the climate metric's future-period (2041-2070) average and the historical-period (1971-2000) average. The RCP 4.5 scenario is produced by the Swedish Meteorological and Hydrological Institute (SMHI) and the wildcard scenario is a fictive scenario.

Climate Metric	Historical (absolute number)	RCP 4,5	Wildcard
Annual average temperature, absolute numbers (°C)	*-2.8*	*-0.4 °C*	*2.1 °C*
Change in annual average temperature (°C)		+ 2.4	+4,9
Change in average winter (DJF) temperature (°C)		+ 2.6	+ 5
Change in average spring (MAM) temperature (°C)		+ 2.4	+4.5
Change in average summer (JJA) temperature (°C)		+ 2.2	+ 4.7
Change in average fall (SON) temperature (°C)		+ 2.4	+ 5.2
Number of days with max. temp. favorable for tree growth (days)	20	35	48
Number of hot days with temp. higher than +20°C (days)	1	6	18
Number of cold days with min. temp. lower than -20°C (days)	20	8	2
Number of days with freeze-thaw events in winter (DJF) (days)	9	15	23
Annual precipitation, absolute numbers (mm)	*468 mm*	*552 mm*	*612 mm*
Change in annual precipitation (%)		+ 18 %	+ 31 %
Average winter (DJF) precipitation (total mm)	126	141	147
Average spring (MAM) precipitation (total mm)	72	81	90
Average summer (JJA) precipitation (total mm)	145	174	207
Average fall (SON) precipitation (total mm)	125	150	171
Number of days with precipitation with more than 10 mm/day (days)	6.1	8.8	11.1
Length of growing season (absolute number of days)	*68 days*	*105 days*	*136 days*
Change in length of growing season (%)		+ 54 %	+ 100%

Appendix 2

Changes until now, reported by Abisko National Park Council, February 2025:

Warmer.
Less snow.
More intense rain/sleet.
Shorter winter season.
No more May tours on skis/snowmobiles.
Erosion damage.
Snowmobile driving is unpredictable and difficult to plan. This affects transportations, inventories of large carnivores and transportation of guests, etc.
Intense rain increases risks for landslides across trails.
Permafrost loosens the ground.
Overheated hikers due to heatwaves.
Drinking water quality in rivers uncertain.
Dehydrated small creeks – more water needs to be carried by hikers.
Changed conditions for plants and animals.
Kebnekaise north and south peaks.
Difficult crossings over running water, tunnels between ice and water.
Glaciers are melting, rainwater is sliding down the ice, creating high flows.
Soil masses - mudslides - no permafrost on the slope.
The lakes get more sediment, unclear water.
Overgrowth / tree line moves upwards.
New fish species are establishing themselves.
Greater risk of accidents, more dangers.
Increasingly unstable and unpredictable.
Have the winds changed direction? Previously predictable more westerly winds, now also more north, east and southerly winds.
Wet conditions during winters.
New conditions are emerging in permit applications.

Appendix 3

Drivers of change

Precipitation
Public right of access might change and be limited
Visitor numbers, Coolcation trend, more visitors
Faster permission processes
Ice, "iciness"
Mountain plants disappear
Will visitor center still exist?
Will younger generations want to stay here
Shorter and worse winters
Less money to management
New products from tourism entrepreneurs
Higher level of security nationally/globally
More warmth/heat from climate
Changes in water quality
Psychological issues, un-wellness, time-stress in society
Less bare mountain
Economy / politics globally/locally
Events in the surrounding world, e.g. war, pandemics, un-unity
Precipitation affects water quality and quantity
The will to mitigate/reduce climate emissions
Trend against being environmentally friendly
Education about climate change
Climate refugees
Increased temperature
Invasive species
Increased presence of military defense/NATO
Changes in population of Abisko village
Increased infrastructure
Entrance fees permitted
Restrictions for visitors because of increased art protection
Global travel limited (quotes)

Appendix 4

Climate Change Scenario Planning Process for Abisko National Park in 2025

18th of February, Abisko National Park Council

10-12 National Park Council meeting
12-13 Lunch.
13-14.45 Climate change workshop.
Clap presentation (10 minutes).
Information about climate changes so far (10 minutes).
Discussion about what effects of climate change participants already see. (15 minutes).
Climate future information, presentation of climate analysis produced by the SMHI. (25 minutes).
Explanation of environmental analysis and what non climate drivers of change can be. (10 minutes).
Break (15 minutes).
Breakout groups generate a list of 20+ driving forces that might shape the future in Abisko National Park and surrounding area the next 25 years. (20 minutes).
Presentation of drivers of change in full group (15 minutes).
Information about next steps in the process (10 minutes).

20th of February, internal working meeting with CLAP team

13-15 Scenario building blocks workshop.
Brainstorming more drivers of change
Explanation of certainties, uncertainties and wildcards
Categorize and specify driving forces.

21th of February, internal working meeting with CLAP team

8.30-10 Scenario Framework Development.
Explanation of scenario framework construction
Discussion of preferred framework to agree on one scenario framework for the upcoming workshop.

27th of February, online pre-webinar (recorded)

13-14.30 Preparation of two-day workshop in Abisko.
CLAP presentation (10 minutes).
Climate future information, presentation of climate analysis produced by the SMHI. (30 minutes).
Park information (10 minutes).
Scenario planning information (20 minutes).
Time for questions (10 minutes).

12th of March, day 1 of workshop in Abisko

12.00 Arrival and lunch
13.00 Welcome and introduction.
Presentation of the agenda.

Presentation of participants together with individual reflection on: “What effects of climate change have you already seen in your work.”
Repetition of climate information and scenario planning from the pre-webinar (20 minutes).
First part of a recorded presentation with Wylie Carr, NPS, from the Europarc Transboundary Network Conference (10 minutes).

14.10-15.45 Presentations about Abisko National Park.

Presentation about facilities (30 minutes), by Eva Oskarsson, nature manager, The County Administrative Board of Norrbotten.
Presentation about visitor use and experience (30 minutes), by Lo Fischer, head of naturum Abisko Visitor Center, The County Administrative Board of Norrbotten.
Presentation about natural science research 30 minutes) by Emily Pickering Pedersen, Abisko Scientific Research Station.

15.45-17 Building out scenarios.

Participants with mixed areas of knowledge divided in separate breakout groups per scenario.
Group discussion 1.1 Effects and events (25 minutes).
Group discussion 1.2 Challenges and opportunities (15 minutes).
Group discussion 2. Narrative and name (25 minutes).
Presentations of narrative and name (10 min).

17-18 Facilitators prepare scenario presentations day 2.

13th of March, day 2 of workshop in Abisko

8.00-8.45. Review of day 1.

Group facilitators report about each scenario effects and events.
Reflections and questions.

8.45-9.30 Goal discussions:

Participants divide into areas of expertise in separate breakout groups per focus area. Breakout groups themed according to natural resources, facilities and visitor experience. Final large group discussion on existing goals.

9.45-11.30. Generating possible adaptation actions.

Presentation of Resist-Accept-Direct Framework and tipping points, a recorded presentation by Wylie Carr, NPS, recorded at the Europarc Transboundary Network Conference 2024.
Group discussion 4. Brainstorming about possible adaptation actions (45 minutes).
11.30-12.30 Lunch.

12.30-13.30. Prioritizing possible actions.

Group discussion 5. Review possible actions and prioritize a few based on key criteria.
13.30-14. Report out possible actions.
14.15-15. Reflections and next steps.
15-16. NPS experience of working with climate change adaptation; a live presentation by Wylie Carr, NPS.

Workshop evaluation and closure.

14th of March, internal working meeting with CLAP team

8.30-11. Reflections of the climate change scenario planning process.

Lessons learned from process steps and reflections from arranging a two-day workshop about climate change adaptation.

Appendix 5

Scenario framework

Framework used in the two-day workshop in Abisko National Park, including scenario titles and narratives produced during the workshop.

Scenario 1 Visitor record became visitor collapse

Visitor records became visitor collapse.

Scenario with 500 000 visitors yearly and moderate changing climate (RCP 4,5)

1.1 What scenarios will occur, what might happen in this scenario in the coming 25 years?

1.2. Imagine the crucial changes/possibilities for the NP during these surc

Visitor's Perspective
Challenges: *Overnight accommodation in Abisko, Lodging for visitors Contaminated water, Many visitors reduce the nature experience Safety risks during flooding*
Opportunities: *Job opportunities, Many get to experience the area Increased revenue for the tourism industry*

Facilities and Installations
Challenges: *Soil wear, Economy, Contaminated water Maintenance of facilities, Consequences of flooding*
Opportunities:
Possibly increased economic activity

Natural Values
Challenges: *Soil erosion, Economy, Contaminated water, Shrub encroachment and changes in natural habitats, Consequences of flooding, Invasive species brought in by visitors, Regulating visitor numbers*
Opportunities: *Many people to educate and inform, Regulate visitor numbers, Citizen science, Possibly increased economy that could lead to better nature management*

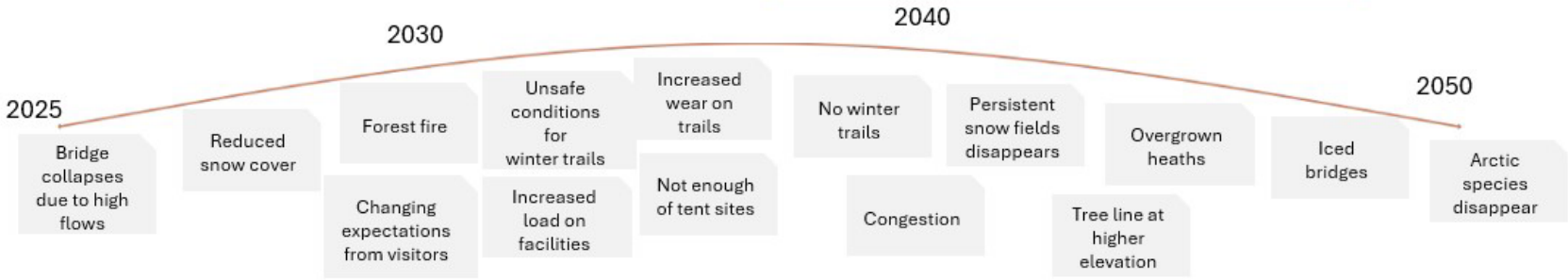
We ended up talking more about 500 000 then about rpc 4,5.

Scenario 2 Hot and crowded

Hot & crowded (scenario title)

Overall Conditions for Abisko NP Scenario 2:
- RCP 8.5
- Doubling the number of visitors 150,000 -> 300,000)
- Average annual temperature increases by 3 degrees
- Average annual precipitation increases by 20%
- Growing season almost twice as long

1.1 Events and development under this scenario over the next [approx. 25] years



1.2. Critical challenges / opportunities for the park under these conditions .

Visitor's perspective

Challenges :
- Social media brings high visitor pressure to certain places
- Perceived congestion
- Visitors focus on cool vacations, not that they visit a national park
- More inexperienced visitors – safety, wear and tear, littering

Both challenges and opportunities:
- Visitor expectations

Facilities and devices

Challenges :
- Increased wear and tear on land and facilities, especially near the entrance to the park
- Harder to maintain a good level of safety for visitors, e.g. near the river

Natural values

Challenges :
- Permafrost and snowpack are decreasing
- Drier ground and extreme rain
- More visitors: wear, littering, disturbance of animals

Both challenges and opportunities:
- Moose are decreasing due to heat
- Reindeer grazing: better or worse in the park/winter grazing land
- Natural values are disappearing, replaced by others (char disappears, other fish species establishes)

Scenario 3 The last skier

“The last skier ” (scenario title)

Overall Conditions for Abisko NP Scenario 3:
-RCP 8.5 - Fewer visitor (a halving , 150,000 -> 75,000)

1.1 Events and development under this scenario over the next [approx. 25] years :

1.2. Critical challenges / opportunities for the park under these conditions .

Visitor's perspective
Challenges :
-More risks in the terrain
- Overgrowth reduces the possibility to see the landscape
-War/unrest may cause disturbance of infrastructure/ communications and make visitors careful.
Opportunities :
-More reindeer because of better forage and longer growing season

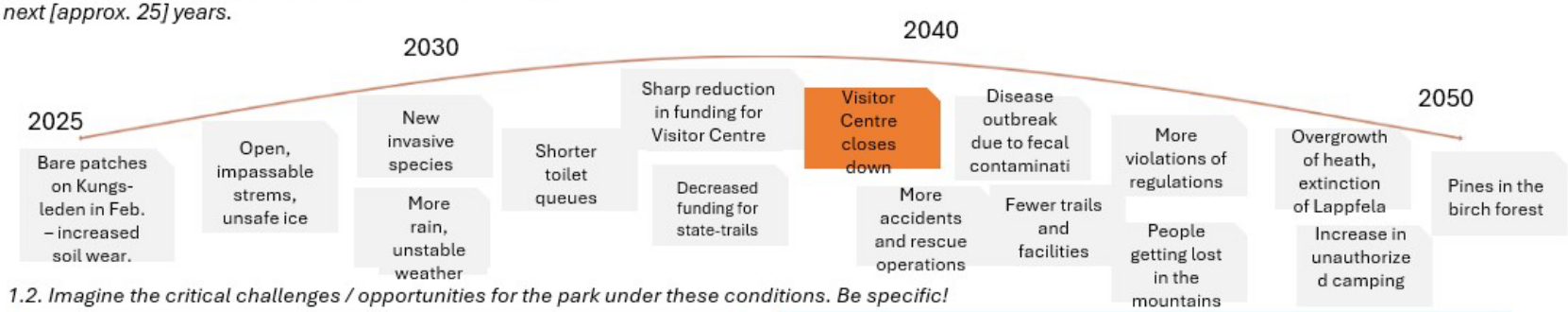
Facilities and devices
Challenges :
- Decreased funding and staff because of fewer visitors , facilities cannot be maintained
- Wet climate , more risks -> facilities requires more maintenance
Opportunities : Limit availability, reduce the number facilities: the park will be more like Sarek NP!

Natural values
Challenges :
- Climate change -> more difficult meet the park's purpose
- War : adaptations such as asphalting of Kungsleden, logistics / military activity -> wildlife disturbed.
Opportunities :
- More reindeer because of better forage and longer growing season.
- Limit accessibility / zoning (+for ex reinforce "central trail") / fewer visitors = calmer = good for nature.
- Allow visitors access only with trained guides (less damage, compliance issues and less need for staff)

Scenario building

Scenario 4:
Fewer visitor (150,000 -> 75,000)
Moderate" climate changes
(RCP 4,5 2011-2070)

1.1. Events and development under this scenario over the next [approx. 25] years.



1.2. Imagine the critical challenges / opportunities for the park under these conditions. Be specific!

Visitor´s perspective
*Longer hiking season, increased safety risks (slippery, unstable stream crossings, heavy rain, erosion).
* Less crowded in the park
*Disappointed visitors who don't see the Northern Lights due to poor weather
*Limited opening hours at Naturum, less information and staff (due to reduced funding from fewer visitors)
*Decline in visitor competence and knowledge about rules etc.
*More rule-breaking and higher damage per visitor

Facilities and devices
*Reduced need for maintenance and less littering due to fewer visitors
*Trails that are not used may be removed
*Focus on quality instead of quantity
*Lower safety (risks of slipping due to ice, moisture, mud, landslides)
*Increasing impact on facilities (flooding/washing away of trails and bridges, moisture/rot)

Natural resources
*Less wear and disturbance for wildlife and reindeer herding
*More peace and quiet for nature
*Declining water quality; risk of fecal contamination on warmer summers
*Natural values and species decrease or disappear
*Alpine tundra becomes overgrown
*More regulation violations after Naturum closure; increased wear

Example of a Scenario Narrative Presentation

Scenario name: “The last skier”

Narrative¿A.conversation.at.the.breakfast.table.in.the.park.rangers⁄cabin, *March 15, 2050*

-"I saw a ski track up on the mountain Nuolja, there was some snowfall there last night, how extraordinary!
-"Could it really be a skier? Skiing stopped around 2045…It seems unlikely - there are hardly any visitors in winter, since it is so muddy and wet, most people come in summer"'
-"I was fishing the other day from my boat and caught an Id! Never saw that fish species before. It is so sad that the Arctic char has disappeared"
-"Another odd thing is that I saw a spruce up on mountain Tjuonas top!"
-"The golden willows have started to bloom near the train station… they have spread here with travelers but they have a wonderful scent!"
"The reindeer grazing is good in the park, since there is no snow. However, they can hardly be anywhere else due to the mining expansion and defense activities"
-"Well, one upside is that the mining industry finally made some compensation measures for the mining expansion, increasing funding for the park management and expanding the size of the park."
-"As a result, the short, paved trails, quad bike trails and drone trails are well maintained. It's good for the visitors who come, and they don't want to walk that far anyway.”

Appendix 6

Exercise 3 – Evaluation of current goals. Filled out worksheets with notes from the workshop

Purpose and objectives of the exercise is to assess whether current concepts (goals, guidelines, objectives) in current governing documents are being achieved today. In exercise 3 we will discuss whether current goals are still realistic in the future and how they might be affected by different future scenarios.

Facilities Goal evaluation

Current goal 1

Abisko National Park should be used in its natural conditions. The park has been divided into three zones. Within zone 1, no facilities for outdoor activities should be established. Within the other zones, paths and trails are allowed. Within zone 3, camping and campfires are permitted. (From the Management Plan.) Comment: Currently, camping is not permitted in zone 3.

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.):

Yes.

Goal discussion: The goal would not hold with increasing visitor numbers. For example, due to problems with camping sites and more people gathering near the central parts of the park. It would be more difficult to achieve “natural conditions” in the park due to the need for paved surfaces & adaptations. There is a need to investigate possibilities to meet the needs linked to an increased number of visitors outside the park.

Current goal 2

The very intensive use of the national park, which is caused by increasing tourism, means that the park requires continuous maintenance and supervision. Therefore, supervision equivalent to one employee´s annual working time is required. (From the Management Plan.)

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.):

Yes- one employee´s annual working time is achieved today (via two employees, Hasse + Eva together) for supervision and maintenance. But NO - one year of work is not enough in today's situation.

Goal discussion: The goal of one employee´s annual working time for maintenance and supervision is not sufficient in the current situation - but can still be achieved if improvements are made for the future (e.g. paving, less demanding measures, possible accommodation, etc.). However, if the number of visitors increases, more resources will be required for supervision and maintenance.

Current goal 3

Sanitary facilities: Toilets and garbage cans are located at the following locations: At STF facilities (tourist station, ski lift, Abiskojaurestugorna), the tent site at Abisko, the Marble quarry (comment: not today), Nissunjåkk, Kågströmshålan, the boat site at Torneträsk. (From the Management Plan.)

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.):

Yes, there are dry toilets located at the specified locations but the Marble quarry. However, garbage disposal has been removed.

Goal discussion: More rainfall & water can mean that today's locations may need to be changed to avoid contamination - regardless of the number of visitors. An update of the park goals and restrictions is needed. An analysis of the needs and solutions may be needed before updating the goals. Clarify the requirements for toilet solutions.

Current goal 4

Goal: Summer trails are primarily intended for hiking during the bare ground season and should therefore be designed to channel visitors to suitable areas with consideration for reindeer herding and to avoid wear and tear on sensitive natural and cultural environment values. Running and cycling may occur, sometimes to a greater extent. The Abisko-Abiskojaure stretch of the Kungsleden has the highest classification (category 3 due to very high visitor pressure): Boardwalks should be built both to improve the possibilities of moving over wet and rocky ground and to avoid wear and tear on the terrain. In the event of extensive wear and tear, the trail surface should be hardened by means of gravel or paving stones. Bridges should be provided over all watercourses, including smaller watercourses on trails. Winter trails are intended for transportation over snow-covered ground. Snowmobile trails are winter trails permitted for use of snowmobiles on well-snow-covered ground. (From the Policy for State owned trail system in the Swedish fells.)

Goal discussion: With more water: an increased need for bridges. The goal's writing works - but there is a need to define when the summer trails are "open" (when it is summer/hiking season, also due to climate change and the increasingly longer bare ground season) - for example, so that visitors do not expect bridges over various watercourses, e.g. early spring and winter. Climate and safety aspects will require "winter bridges" on current winter trails, or alternatively rerouting trails and, where there is potential for shared use, possibly adapting summer trail bridges to winter needs as well. Bridges should not be used to extend the season; therefore, the question of how long the seasons should be considered to be in the future. Clarifications on this will be needed. Actions in order to ensure compliance or changes in routings may be needed on snowmobile trails where there is not sufficient snow cover.

Other documents

- Vägledning för förvaltning av Naturvårdsverkets fastigheter (2008) (Guidance for the management of the Swedish Environmental Protection Agency's properties).
- Sveriges friluftsmål: Tillgänglig natur för alla. (Sweden´s outdoor recreation goals.)
- Skyddade områden som resurs för friluftsliv. (Protected areas as a resource for outdoor recreation.)
- Värna Vårda Visa (Guidelines from the Swedish Environmental Protection Agency)
- Reindeer Husbandry Act (Rennäringslagen).
- The Public Right of Access (Allemansrätten).

Natural values Goal evaluation

Current goal 1

Goal: Abisko National Park shall be cared for and managed so that a high Nordic Mountain landscape is preserved in its natural state. (From the management plan.)

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.)

Yes, the goal will probably be achieved. Channeling visitors.

Goal discussion: The goal is outdated and needs to be updated. More active management is probably needed to achieve the goals.

Current goal 2

Goal: Claimed by the woodland. Vegetation is allowed to develop freely. No felling of trees is allowed (with certain exceptions). (From the management plan.)

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.)

Yes. No action is taken.

Goal discussion: If the forest is allowed to develop freely, it will lead to changes in the forest, not preservation of a (historical) condition.

Current goal 3

Goal: Management of the mountain tundra. A High Nordic Mountain landscape in its natural state. No actions may be taken (with certain exceptions). (From the management plan.)

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.)

Yes. No action is taken.

Goal discussion: The alpine tundra is at risk of becoming overgrown with bushes, as outdoor recreation and reindeer herding today are different from what they were in 1909.

Current goal 4

Goal: The purpose of protecting the area is to preserve the distinctive mosaic of alpine habitats with their undisturbed character, hydrological dynamics and rich biodiversity. These rich environments and the designated species should be given the opportunity to develop naturally without negative human impact. The habitat types should be allowed to continue to develop freely, and no prioritized actions are currently in place. (From the Natura 2000 Conservation plan.)

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.)

Partly. Channeling visitors. No further action is taken.

Goal discussion: Small habitats are sensitive to where paths are drawn.

Current goal 5

Goal: Conservation objectives Alpine heaths. The habitat type shall continue to have an area of at least 1467.8 ha and consist of an intact natural alpine heath. Extensive reindeer grazing shall contribute to shaping the plant community. Wear and tear from human activity, e.g. outdoor recreation and off-road driving, shall be negligible. The habitat type shall have natural hydrological conditions and a clear element of typical species.

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.)

No answer noted.

Goal discussion: No answer noted.

Current goal 6

Goal: Conservation target Mountain birch forest. The habitat type shall continue to have an area of at least 3476.3 ha. It shall have a natural structure and be characterized by natural succession and disturbance, or alternatively by nature conservation measures. The forest shall have a natural tree species mix, consisting of at least 50% mountain birch, with a wide age range, from seedlings to very old trees, and shall have a presence of standing and lying dead wood. Foreign tree species or other alien species that may pose a threat to the natural environment shall not occur. The hydrology of the area shall be intact, and no ditches with a drainage effect shall be present. There shall also be species of vascular plants, birds and/or lichens typical of the habitat type.

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.)

No answer noted.

Goal discussion: No answer noted.

Habitat types and species to be preserved in the area can be found in the conservation plan.

Visitors experience Goal evaluation

Current goal 1

Goal: Commercial activities should in principle only be permitted if they do not cause disturbance to the land, vegetation or fauna or do not conflict with mobile outdoor recreation. Activities should be limited to areas already affected by tourism or mobile outdoor recreation facilities. (From the management plan.)

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.)

Yes – but it's hard to know where the line is (“disruption”, “opposition to active outdoor life”). However, new regulations: Commercial activities are permitted.

Goal discussion: permit requirements are a good thing, allows the activity to be managed and becomes more controlled, often with guides. There will be less snowmobile gangs (who does not have permits), there will also be less congestion on the trails. Dog sledding has decreased

radically in the NP on Kungsleden. (Supervision). Good with flexibility when designing permits. Possibility to control / steer activities when writing the permit decision. Free tourism (which does not require permits) is more difficult to control. It is good to include tourism in the entire area in the thinking, e.g. from Abisko Östra. A holistic view.

Current goal 2

Goal: Abisko National Park shall be used in its natural conditions. The park has been divided into three zones. Within zone 1, no facilities shall be prepared for outdoor activities. Within the other zones, paths and trails may be arranged. Within zone 3, camping and campfires are permitted. (From the management plan.)

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.)

Yes. Zone 1 is protected. Not mentioned to visitors.

Goal discussion: The bridge over Kårsafallen: Leads people into zone 1 (on the south side of the bridge). Why is the bridge there? Make a loop instead? Rest area north of the bridge (i.e. in zone 2)? Zoning is good both internally (helping to prioritize investments, etc.) and externally (visitors' expectations of service). Zoning is very important. Good clear trails, signage. “A bit messy in the summer.”

Current goal 3

Goal: The very intensive use of the national park, which is caused by increasing tourism, means that the park requires continuous maintenance and supervision. Therefore, supervision equivalent to at least one annual workforce is required. (From the management plan.)

Will the goal be achieved today? (Give examples of actions taken to achieve the goal.)

No. The goal must be flexible with respect to resources.

Goal discussion: Goals for the administration? Handling increased number of visitors?

Current goal 4 (regulations)

Park regulations regulate visitation, e.g. Prohibition to land an aircraft, camping is prohibited except in designated areas, it is prohibited to carry out organized tours or other organized activities more than three times per year or with more than 35 participants, conduct sport competitions or sporting events or perform dog sledding with more than four dogs – without permission from the County Administrative Board.

Other documents

- Sweden´s outdoor recreation goals.
- Protected areas as a resource for outdoor activities
- Goals for Sweden´s National Parks
- Objectives for the Visitor Center Naturum Abisko
- Policy for State-owned trail system in the Swedish fells.
- Värna Vårda Visa. Policy from the Swedish Environmental Protection Agency.
- Renskötselrätten. Reindeer Husbandry Act.
- Public Right of Access (Allemansrätten).

Additional comments on visitation:

Nisson Tent site - why is it there? Could it be moved to a safer location? The maintenance of a rest and tent site must be manageable, cannot be too far from the main entrance and the road. Can the tent site be outside the NP instead?

Information to visitors is increasingly important with climate change.

Information can also be provided outside in the park at suitable locations:

- Nisson tent site.
- Reindeer fence Abiskojaure – Alesjaure (after Keron hill)
- Reindeer farm Abisko East
- STF cabins

A training course for stakeholders is planned to be launched, which can ensure tourism organizers' knowledge and relationship with the NP administration.

Good trails channel and direct visitors.

Will visitors spread out more if there is increased congestion around the main entrance? If so, perhaps more trails/nature paths are needed.

Visitor expectations.

Appendix 7

Exercise 5 Abisko Workshop

Purpose and objectives of the exercise

To evaluate and rank adaptation measures that emerged in exercise 4.

Implementation of the exercise

Add additional adaptation measures to the flip chart if they emerged during lunch.

Clarify the evaluation criteria

Scoring scale 1-6
Effectiveness in meeting the challenges:
1: Not at all effective, 6: Very effective
Feasibility:
1: Not at all feasible, 6: Very feasible
Discuss each criterion as a group and make sure the group agrees on what the criteria mean and how the scoring works.

Note in the table:

- Discuss and score each adaptation measure for each criterion.
- Write a short phrase or sentence explaining the scoring.
- After scoring all measures, add the two scores for each measure and then rank the measures by total score.

On post-it:

- Write the total score for the action in the lower right corner of each post-it.
- Put the highest scorers at the top of each scenario field on your flipchart
  If there is time: Discuss in the group whether these reflect the highest priority adaptation actions that the park should implement, and re-rank as needed. If possible, it is a good idea to try to have at least one Accept and one Resist action included to ensure that prioritized actions span a broad range.

Facilities

Below are the adaptation measures for facilities, based on scenarios (actions marked with **+** were placed on the line between the upper two scenarios). All actions were not rated due to lack of time.

Actions placed in the upper right quadrant (Hot and crowded scenario)

Guardrails at the canyon

Efficiency: 6 (Major improvement of safety). Feasibility: 6 (No high cost, simple). Total points 12. Ranking 1.

Reinforced/hardscaped trails and surfaces

(e.g. gravel, paving or boardwalks ramps higher above the ground, protecting from wear and tear).
Efficiency: 6 (Sustainable). Feasibility: 5 (Costly but practically doable). Total points: 11. Ranking 2.

Adapt mount Njullá for more alpine and other winter guests with the aim of keeping them concentrated to a smaller area

(zoning to a snow-safe place that can handle more visitors - snow cannon installation for better snow cover and less wear and tear on the ground).
Efficiency: 6 (concentrates visitors). Feasibility: 5 (Practically feasible. Minus on acceptance and economy.) Total points 11. Ranking 2.

Pave (asphalt) trails

Efficiency: 6 (Durable, can withstand a lot of wear and tear). Feasibility: 3 (Limited access for asphalt machines, costly). Total points 9. Score 3.

Close the park parts of the year to protect nature and increase safety for visitors.

(Combined with zoning would get higher points on evaluation.)
Efficiency: 5 (Visitors can access anyway. Greater need for supervision.) Feasibility: 4 (Practically feasible. Possible low acceptance.). Total score 9. Ranking 3.

Create bike paths to extend the season (on paved surfaces).

Total points 8. Ranking 4.

Grazing goats (clearing trees and shrubs)

Efficiency: 4 An effective way to maintain open landscape. Feasibility: 2. Conflicts with reindeer herding, safety, animal welfare legislation, fencing required. Total points: 6. Ranking. 5.

Snow cannon on winter trails.

Efficiency: 4 (Extends the season but still requires sub-zero temperatures.) Feasibility: 1. Requires cannons and water pipes. Total points 5. Ranking 6.

Unscored actions in this scenario:

Pedestrian ramps for scooters and skis. (Gravel to where the snow begins during transport.)

Actions placed in the lower right quadrant (The Last Skier Scenario)

Build a cable car in the park at dangerous locations

Feasible at lower visitation levels. Justification and points missing. Total score 9. Ranking 3.

Unscored actions in this quadrant

Park fee / crowdfunding / "buy a park" sponsorship (*robust action regardless of scenario).*
Digital hiking along trails to experience "the good times" *(accessibility, less maintenance).*
Retractable bridges controlled via water level gauges (raised during extreme flows).
Cooling coils in the ground under winter trails.
Studded shoes required for hikers at certain times of the year (reduce risk of slipping due to increasingly icy trails).

Actions in the lower left quadrant (Wet, boring and warn out Scenario)

Unscored actions in this quadrant

Remove facilities (to reduce cost).

Actions placed in the upper left quadrant, (From Visitor Records to Visitor Collapse Scenario)

Unscored actions in this scenario:

"Digital tags" for visitors to limit and inform where they can be in the park +
Preparing a good photo point (channeling) +
Toilet strategy (robust action regardless of scenario). For example, pay toilets in the form of incineration toilets (QR code, connected).
Strengthened visitor management with the aim of receiving more visitors not familiar to the surroundings and outdoor life, including: More staff, adapted visitor center, Trained Guides and More supervision of compliance.
Create a fund for the maintenance and adaptation of trails, independent of temporary political decisions +
Boat transport across Abiskojaure (reduce risks and increase accessibility) +
Floating (higher) boardwalk (better view, less ground wear).
Observation tower for those who want to experience the park without having to hike.
Snow avalanche warning system.
Increased rate of clearing of trees and shrubs along the trails.

Visitor experience

Here are the adaptation options suggested during the two-day workshop by the group focusing on visitor safety and experience, while considering park values and climate change effects.

Consider runoff and avalanche risk outside the National Park.

Effectiveness: 6 (Safety concerns due to surrounding climate change impacts). Feasibility: 6 (Knowledge may exist – what do we do with it? Further actions likely needed.) Total score 12. Ranking 1.

Remove the bridge over Kårsafallet to limit access/erosion in zone 1

Effectiveness: 6 (Reduces erosion and visitation in sensitive areas). Feasibility: 5 (Opposition from STF and some of the visitors likely). Total score: 11. Ranking 2.

Rotational use of short trails for ecosystem recovery and visitor experience

Effectiveness: 6 (Recovery rates varies with habitat + trails can still be used partly). Feasibility: 4 (Requires communication and staff, must be explained and justified to visitors). Total score 8. Ranking 6.

Limit number of visitors per day/week/month

Effectiveness: 6 (Prtects nature, improves the experience). Feasibility: 1 (Well-known area, difficult to restrict, consider public right of access, would require less promotion). Total score 9. Ranking 5.

Investigate Kungsleden trail (especially Nisson – Abiskojaure campsite. Coordinate with ATV routes?

Effectiveness: 4. (Could reduce erosion, improve experience, support reindeer husbandry). Feasibility: 5 (Expensive but feasible). Total score: 9. Ranking 5.

Adopt a comprehensive tourism strategy for the entire area

Effectiveness: 5. (Park tourism is affected; park management must stay focused). Feasibility: 5 (Park Council is one channel— need of a broader forum?). Total score: 10. Ranking 3.

Convert Kårsa trail into a loop, then remove the bridge

Effectiveness: 4 (Loops are preferred by visitors; supports related action). Feasibility: 5 (Implications for development in zone 2?). Total score 9. Ranking: 4.

Here is a list of unscored suggested adaptation options for each scenario. These include both infrastructural and communicative actions. During brainstorming, various adaptation strategies (Resist, Adapt, Direct) were considered.

Unscored adaptation options by Scenario

Scenario: Hot and Crowded

Install boardwalks through Kungsleden.
Inform about ongoing changes.
Visitors must adapt to natural conditions.
Relocate Nisson tent site.
Require permits + guides to enter the park.
Redirect visitors with consideration for reindeer herding.
Dissolve the national park.
Expand the national park.
Cap visitor numbers.
Construct boardwalks; walking off them prohibited.
Strengthen web/social media outreach.
Continue visitor redirection.
Provide regular training for tour operators.
Encourage guided tours (permits, training, all scenarios).

Scenario: The Last Skier

Analyze tent site placement (including areas outside the park).
Enable ecosystem restoration and recovery.

Scenario: Wet, Conflict-Ridden and Deteriorating

Offer alternative activities.
Raise national political awareness of the importance of the visitor centre (Naturum).
Use digital tools (web, AI, social media).
Remove Nisson tent site.

Scenario: From Visitor Records to Visitor Collapse

Establish capacity thresholds for visitors and management.
Visitor counting (collaborate with Mid Sweden University).
Develop more loop trails.
Analyze movement patterns.
Improve trail markings and boardwalks.
Promote 'soft steering' to minimize erosion.
Upgrade STF sewage system.
Communicate at moments of receptiveness.
Advocate for more accommodation options.
Use permits to steer commercial activity.
Educate on outdoor toileting behavior.

Natural resources

This list includes adaptation actions, associated scenarios, RAD classification, scores with justifications, and rankings. Not all adaptation actions were scored.

Actions in the upper right corner (Hot and Crowded Scenario)

Unscored adaptation options

More zoning, and more regulations in different zones.
Tourist tax to finance management. Limit the number of visitors in different zones and introduce a guide requirement in some zones.
More facilities along well-visited trails. Encourage visitors to stick to trails to protect fragile nature.

Actions in the lower right corner (The Last Skier Scenario)

Unscored adaptation options

Clear overgrowth vegetation (bushes and young trees) from subalpine heaths.
Build shade planks to maintain permafrost at important locations.
Construct dams for sedimentation of sludge at high flows.
Allow mountain birch forests to develop freely.
Use prescribed burning to prevent overgrowth.

Actions in the lower left corner (Wet, Boring and Warn out Scenario)

Expand the National Park to include at least adjacent Natura 2000 areas, preferably an even larger area

Effectiveness: 6 (A larger protected area provides more opportunities for adaptation actions). Feasibility: 2 (Difficult to implement action as there is no public opinion to support it. Acceptance from the environment is expected to be low). Total score: 8. Ranking: 3.

Extensive reindeer grazing in mountain birch forests and alpine tundra

Effectiveness: 6 (Grazing is a natural part of the mountain ecosystem. Grazing already exists.) Feasibility: 3 (Uncertain future for reindeer grazing due to exploitation of pastureland, changed grazing conditions due to climate change, etc.). Score: 9. Ranking 2.

Intensive reindeer/goat/sheep grazing directed to the tree line zone

Effectiveness: 5 (Keeping down bushes and small shrub plants.
You need to move the animals around so that the nutrient supply is evenly distributed). Feasibility: 1 (Expensive and low acceptance.) Total score: 6. Ranking: 4.

Selective logging of Mountain Birch Forest, especially closest to Alpine tundra zone

Effectiveness: 3 (Is forest thinning possible? Effects of increasing moth larvae outbreaks? Efficiency depends on other factors). Feasibility: 2 (Prohibited according to regulations, complicated to change regulations. Resource-intensive.). Total score: 5. Ranking: 5.

Unscored adaptation options in this scenario

Renew the management plan/goals to modernize them based on current state of nature, future changes, and current and future needs.
Adaptive management plan.
Set up snow fences to collect snow for permanent snow fields.
Manually remove snow from Palsa mires.
Place outdoor toilets at wetlands or sand ridges situated at some distance from the water.
Contribute to “ATV-bridges” to avoid wear and tear.
Manual removal of invasive species, such as Swiss stone pine (Pinus cembra).

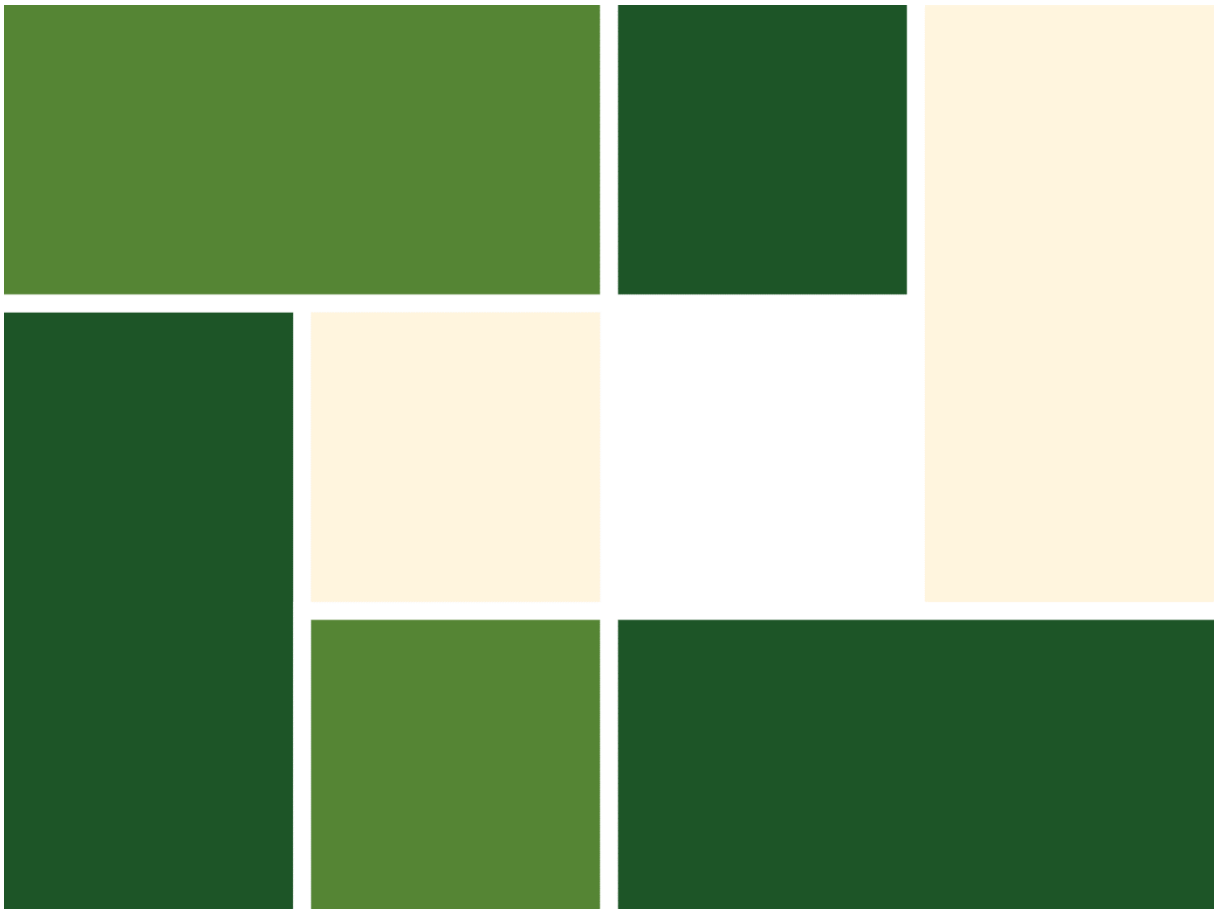
Adaptation options in the upper left corner (Visitor record became visitor collapse Scenario)

More distinct and strict zoning of the National Park

Effectiveness: 5 (Undisturbed areas needed. Reduces wear and tear.) Feasibility: 5 (Difficult with prohibitions. A better way is to canalize, for example, through trail marking. Access prohibition in sensitive areas.). Total score 10. Ranking: 1.

Unscored actions in this Scenario

Cover snowfields/glaciers.
Hire volunteers to uproot Swiss stone pines.
Increased supervision of illegal hunting to protect endangered predators.
Increase the presence of staff in the park to enforce restrictions (supervision and information).
Limit the number of visitors.
Prohibit visitors in zones to promote reindeer grazing.
Limit the number of visitors to certain areas and during certain periods to protect nature, especially sensitive species. Let nature rest.
Prohibition of walking off trails.
Canalizing visitors, e.g. along trails and in certain areas.
More footbridges to protect ground vegetation and reduce wear and tear.
Prohibit cycling or put gravel on the trails.
“Poop bags” - visitors are requested to take their feces out of the park.
Drones and helicopters instead of ATVs.



Länsstyrelsen
Norrbotten

www.lansstyrelsen.se