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NATUR'ADAPT CLIMATE CHANGE ADAPTATION PROCESS

A methodological guide to developing a vulnerability and opportunities assessment and an adaptation plan for a protected area

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« You can't predict the future, but you can prepare for it. »

Maurice Blondel

Notice

This guide has been developed in France. This is why many of the examples and links are French. However, we believe that the proposed process can be applied to many contexts in Europe. We are therefore offering this adapted version in English. Some content specific to France has been removed. Please note that six of the eight factsheets have also been translated (nos. 1, 2, 5, 6, 7 and 8). Enjoy your reading!

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The Natur'Adapt methodological working group, which was set up to develop the methodology described in this guide
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The 15 managers of the project's test sites, who then tested the process and also helped to develop a final version of the process and guide
The members of the review committee set up to finalise this methodological guide.

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Quotation from the work

COUDURIER C. et al, 2023. Natur'Adapt climate change adaptation process – A methodological guide to developing a vulnerability and opportunities assessment and an adaptation plan for a protected area (adapted version for European distribution). LIFE Natur'Adapt – Réserves Naturelles de France. 68 p.

Table of contents

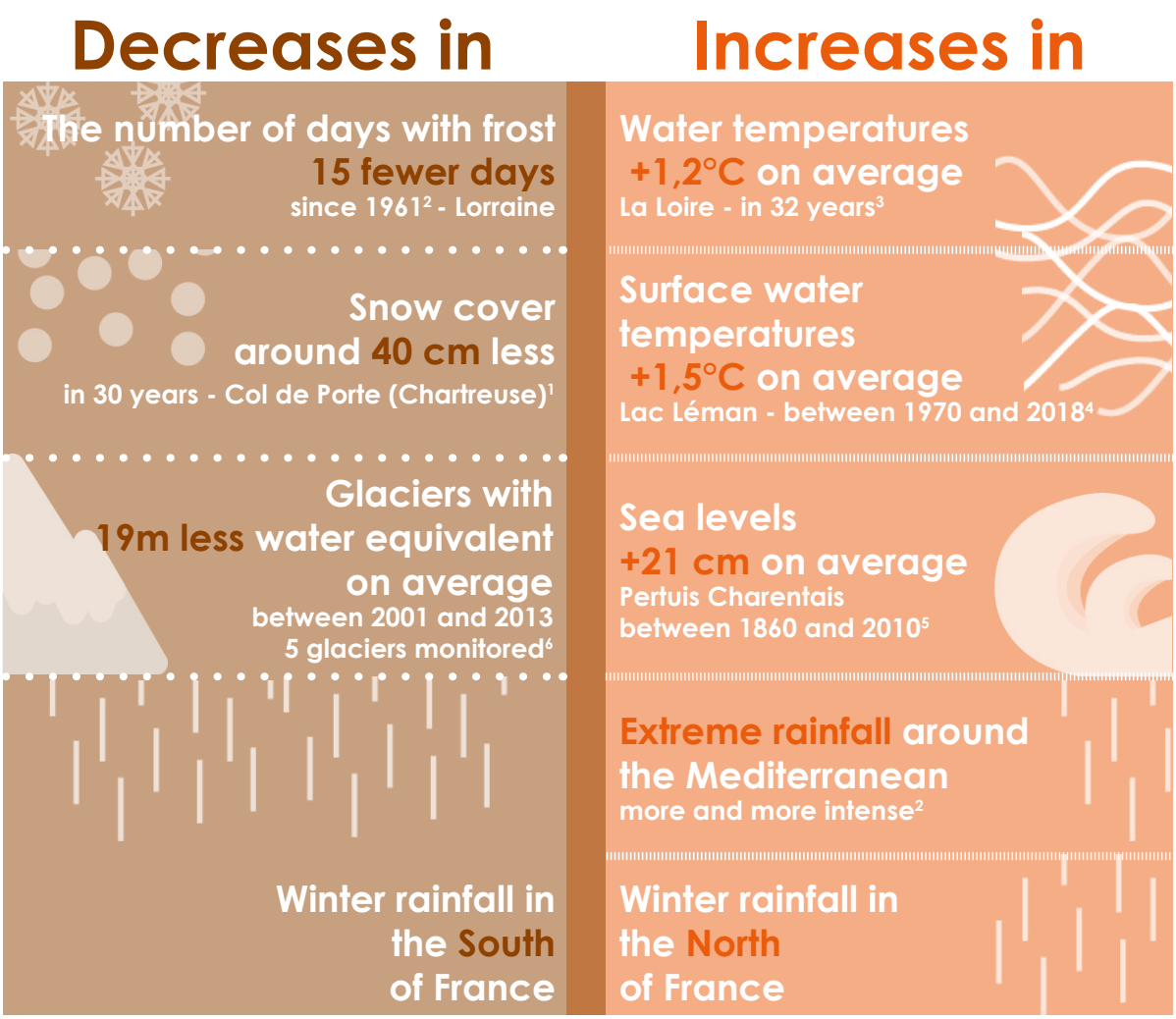
Introduction

Natur'Adapt methodological guide to adapting to climate change

The urgent need to adapt

Climate change is happening. For example, average air temperatures in Europe have risen by around 2°C since the beginning of the 20th century[1].

Numerous other signs of climate change can be seen at local level, for example in France:



These climatic changes have a direct impact on nature, altering the abundance, distribution and functioning of species, environments and ecosystems. Some of these impacts are already visible in France and Europe:

The northward or high-altitude migration of certain species, including pathogens

+ 5.6 km/year northwards for the pine processionary moth[5]

Shift in migration dates

6 days on average for the date of arrival of migratory birds in France between 2017 and 1989[4]

Disruption of interactions between species

When European pied flycatchers return from Africa, they struggle to find available nesting cavities, as they have already been occupied by tits which are nesting earlier because of climate change[7]

[1] European envionment agency, 2023. Global and European temperatures. https://www.eea.europa.eu/ims/global-and-european-temperatures
[2] ONERC, 2022b. Impacts du changement climatique : Atmosphère, Températures et Précipitations.
[3] Eaufrance, 2022. Les impacts du changement climatique sur l'eau.
[4] ONERC, 2022c. Impacts du changement climatique : Eau et Biodiversité.
[5] Réserves Naturelles de France, 2019. LIFE Natur'Adapt - L'indispensable Adaptation.
[6] ONERC, 2022d. Impacts du changement climatique : Montagne et Glaciers.
[7] LPO, 2022. Gobemouche noir.

Climate change also has an indirect impact on nature, through changes in human activities in response to climate change. These changes include:

Increased use of natural areas in search of fresh air

Changes to grazing systems as a result of increased droughts

Changes in the frequency of forest felling

These effects will worsen, while others may occur quickly and unpredictably, particularly in connection with extreme events.

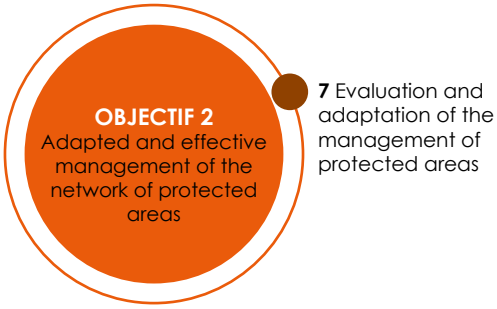
Protected areas are therefore directly impacted by climate change: it is an additional pressure that risks significantly changing the natural environment they seek to protect. Some species and environments will be lost, others will appear and balances will be altered. We need to anticipate and prepare for these changes!

A PROTECTED AREA

A-Z

A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values[8].

GIVEN THESE FACTS, PROTECTED AREA MANAGERS ARE FACED WITH THE NEED TO ADAPT THEIR MANAGEMENT TO CURRENT AND FUTURE CLIMATE CHANGE.



In France, this need is clearly set out in the 2030 national strategy for protected areas, particularly in ***measure 7 of objective 2.***

LIFE Natur'Adapt was set up and this methodological guide was written to help them achieve this.

ADAPTING TO CLIMATE CHANGE

A-Z

Generally speaking, the aim of adapting to climate change is to anticipate and reduce the consequences of climate change on natural systems and society[9]. It is a process of adjusting to the current or expected climate and its consequences, so as to mitigate the harmful effects and harness the beneficial effects[10].

In the context of protected areas, we are concerned here with adapting their management, i.e. adapting the actions, practices, operations, measures, tools and resources used to preserve the natural heritage of the protected area (through studies, monitoring, surveillance, works, maintenance, regulations, agreements, governance, awareness-raising, education, events, etc.).

[8] *IUCN Definition, 2008. https://www.iucn.org*
[9] *ADEME, 2019. Construire des trajectoires d'adaptation au changement climatique - Guide méthodologique.*
[10] *GIEC, 2019. Glossaire.*

The Natur'Adapt process

Who is it for and why?

The Natur'Adapt process described in this methodological guide has been developed to help **protected area managers** to integrate climate change into their **management practices.**

Who?

It is therefore aimed **at all managers of protected areas**, whatever their protection status.

It is therefore designed to be adapted to the different contexts and tasks of the various types of protected areas in France, and more generally in Europe. For this reason, the phases and stages presented in the guide are deliberately generic so as to provide a common framework that can be used by everyone.

Factsheets will be appended to the guide to make it easier to adapt the process to different protected area contexts (large protected areas, Natura 2000 sites, marine environments, etc.).

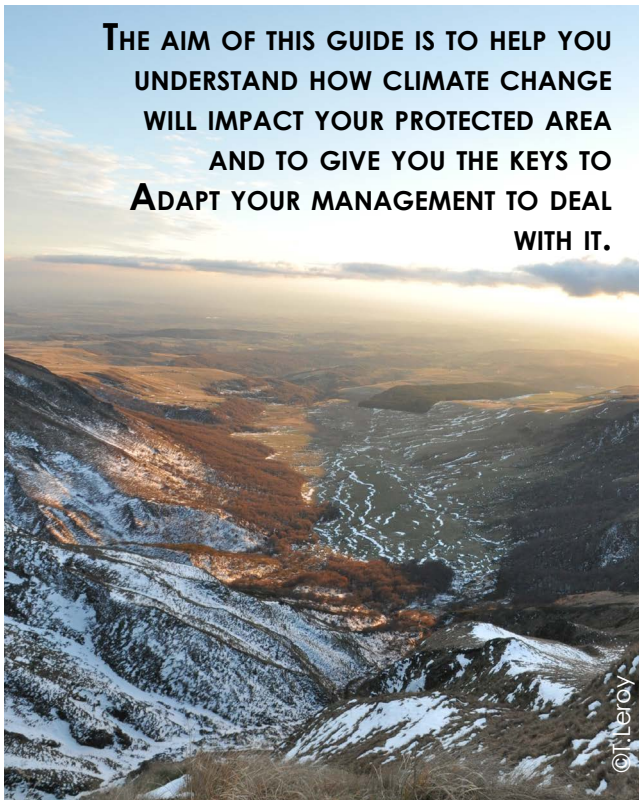
The person who will lead and coordinate the climate change **adaptation process** in the protected area is hereinafter referred to as the '**process leader**' (conservationist, Natura 2000 officer, national park or regional nature park officer, etc.).

What?

The Natur'Adapt process involves carrying out a **vulnerability** and opportunities **assessment** then, on this basis, drawing up a **climate change adaptation plan** for the protected area as a whole.

When?

It can be implemented at any point in the management cycle. The results can then be considered in ongoing management and incorporated into the reference document when it is due for revision.



Manager

A-Z

The term 'manager' refers to the protected area management body (and its representatives), in the sense of **managers of the project for this area**, as set out in its management reference document (management plan, charter, objectives document)

Management document or Management reference document

A-Z

A strategic document that defines a **long-term vision and a** short/medium-term **operational programme for a protected area**[11]. This includes management plans, Natura 2000 objectives documents, park charters, regional contracts for sensitive natural areas, etc

[11] *Ministère de la transition écologique et Ministère de la Mer, 2021. Stratégie nationale pour les aires protégées 2030.*

How has it been developed?

The Natur'Adapt process was developed as part of the **LIFE Natur'Adapt project.**

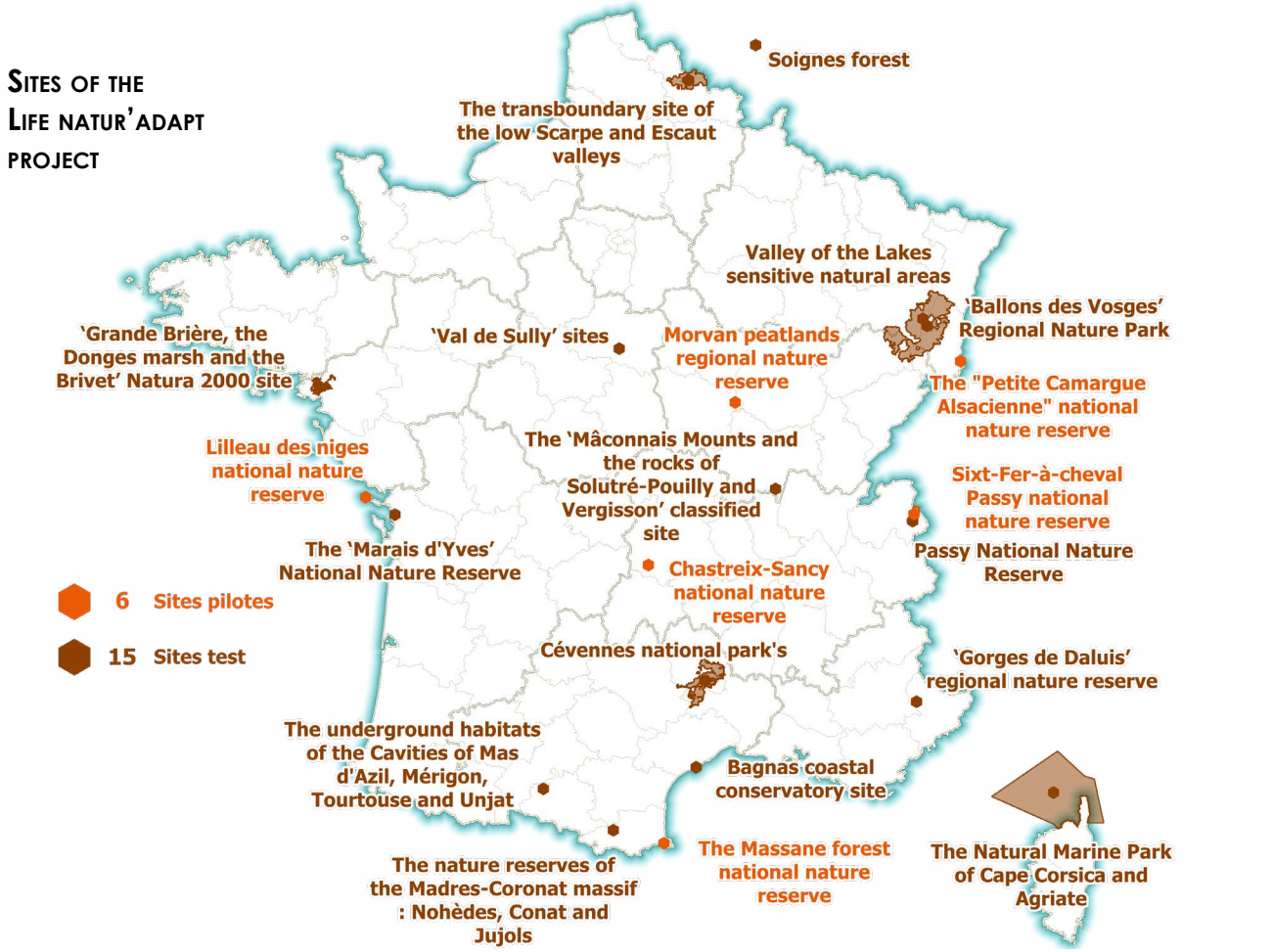
To develop it, a dedicated **working group** was set up and analysed **seven existing** international **methodological guides** (list available in the bibliography of this guide) as well as **the needs identified among European managers**[12].

The methodological framework developed by this working group was **tested for 18 months in six nature reserves** that were partners in the project. It was then revisited and improved to be **tested for 12 months on 15 new sites** with different protection statuses.

THE LIFE NATUR'ADAPT PROJECT

The LIFE Natur'Adapt project (2018–2023) aims to help factor climate change into the management of protected areas in France and Europe. To achieve this, a group of 10 partners have developed a number of tools, including this guide. They have been tested in 21 protected areas (mainly in France) with a variety of profiles, to ensure that they are relevant and operational.

These experimentation and testing phases have enabled the methodology to be put to the test in the field and in different contexts, thereby improving its relevance and reproducibility.



Map of Natur'Adapt experimental and test sites

[12]*EUROPARC, RNF, 2019. Intégration du changement climatique dans la gestion des espaces naturels protégés - Initiatives existantes et attentes des gestionnaires européens.*

Methodological principles

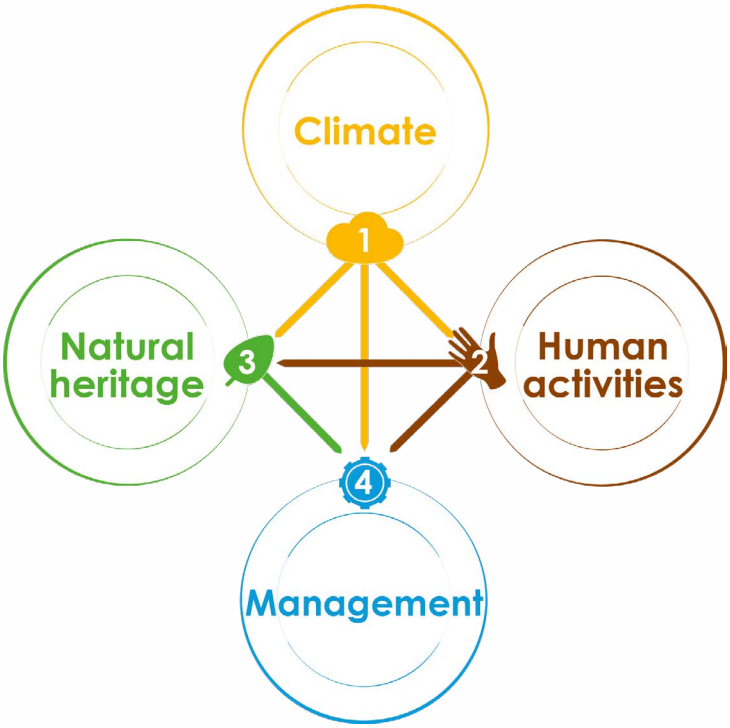
Before going into the details of the process, here are a few methodological principles that characterise it.

Four components and objects of analysis to represent the protected area

One of the objectives of the Natur'Adapt process is to understand the impacts of climate change on the protected area in question through a vulnerability and opportunities assessment. Climate change will have an impact on the **protected area as a whole**.

It is neither possible nor useful to analyse in detail the effects of climate change on each of component of the protected area (for example, on all the species or all the habitats). The idea is to create a simplified overview of the protected area.

To do this, it was decided to break it down into **four representative components** : the climate, natural heritage, human activities and the management actions and resources implemented by the manager. **Within each of these components, the methodology is based on a selection of 'objects of analysis**,' i.e. representative elements of the component at the centre of the analysis. These are explained for each component in the diagram below.



« We have to learn to make sacrifices, to not be able to do everything straight away, to make choices. »

How to select your objects of analysis within each component is detailed in the prospective analysis section of the guide. We recommend **limiting the total number of objects of analysis to between 20 and 30,** based on feedback from the 21 Natur'Adapt sites.

Analysis of the effects of climate change on these 'objects,' which are representative of the four components of the protected area, then provides an overall picture of the possible changes in the protected area as a result of climate change.

"Management actions and resources"

A-Z

The « management actions and resources » component covers all the actions, practices, operations, measures, tools and resources mobilised to preserve the natural heritage of the protected area: studies, monitoring, surveillance, works, maintenance, regulations, agreements, governance, awareness-raising, education, events, etc.

components and

Objects of analysis

1 Climate

Structural climate parameters and indicators for the protected area

2 Human activities

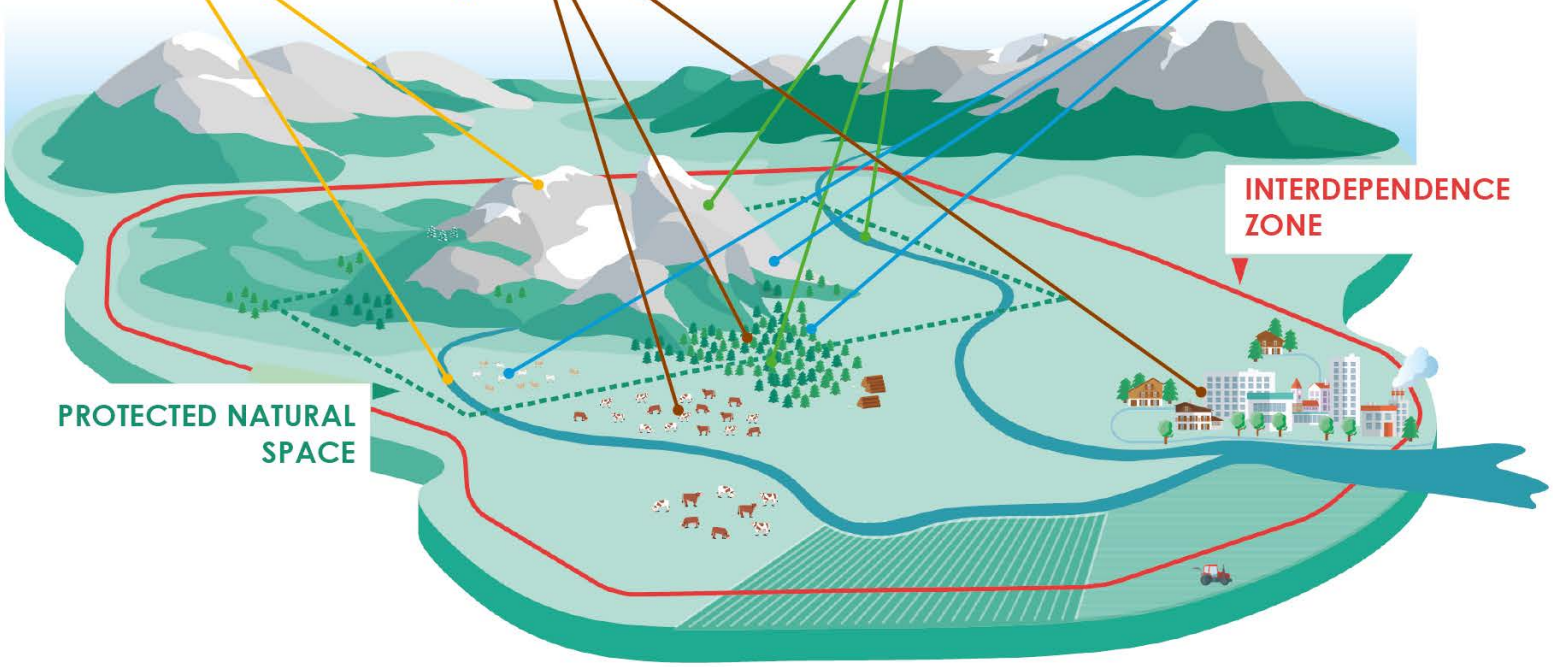
Human activities with **the most influence** on the natural heritage of the protected area and its management

3 Natural heritage

Species, habitats and functions which are **representative** and/or **symbolic** of the area

4 Management

The main **actions and resources implemented to protect** the natural heritage of the protected area



Methodological principles – Contd.

A PROSPECTIVE CROSS-ANALYSIS OF THE FOUR COMPONENTS

Climate change has a **direct impact on our natural heritage**. It also has an impact **on human activities** in and around protected areas, and these changes will also have consequences for natural heritage. These are the **indirect impacts** of climate change. Similarly, **management actions and resources** will be affected directly by climate change and indirectly by the way in which human activities and natural heritage evolve.

Understanding the effects of climate change on protected areas therefore requires **a prospective cross-analysis of the direct effects** of climate change on each of the components of a protected area and the **indirect effects**, linked to the interactions that exist between the different components of the protected area.

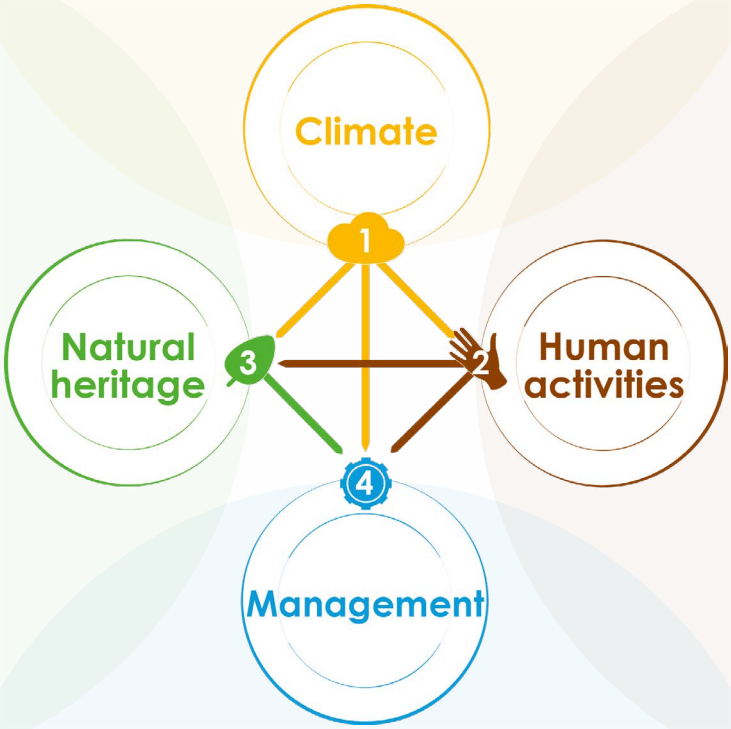
PROSPECTIVE (ANALYSIS)

A-Z

This means imagining possible futures in order to inform present-day choices. It's an intellectual process, a time for reflection to look to the future in a reasoned and holistic way. It enables us to anticipate rather than suffer, and to guide our decisions towards a desirable future.[13]

To carry out this cross-analysis, we propose to look first at:

1 **Changing climate**



3 **Then changes in natural heritage** as a result of climate change AND changes in human activities in the future

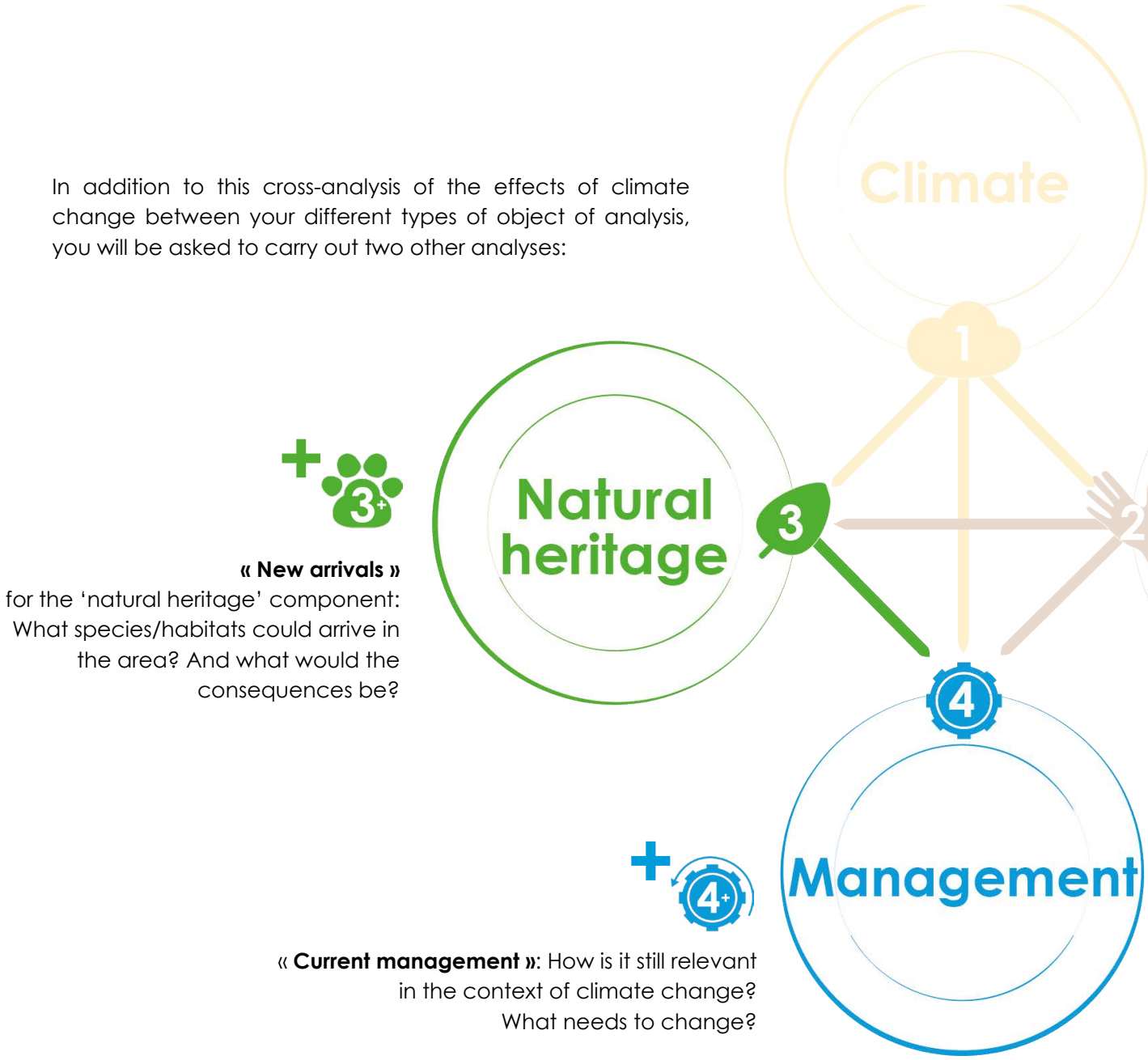
2 **Then changes in human activities** as a result of climate change, which may seem counter-intuitive but is justified by the need to understand these changes in order to understand the indirect impacts of climate change on natural heritage.

4 Finally, the effects of climate change, changes in human activities and natural heritage on the management of **the protected area.**

Finally, the **process is iterative** to take account of the many interactions between the four components: **you will navigate between these four analyses several times.**

[13] *Société française de prospective, 2022. Qu'est-ce que La PROSPECTIVE ?*

In addition to this cross-analysis of the effects of climate change between your different types of object of analysis, you will be asked to carry out two other analyses:



« New arrivals » for the 'natural heritage' component: What species/habitats could arrive in the area? And what would the consequences be?

« **Current management »**: How is it still relevant in the context of climate change? What needs to change?

All this is detailed in the sections dedicated to these components in the « prospective analysis » phase.

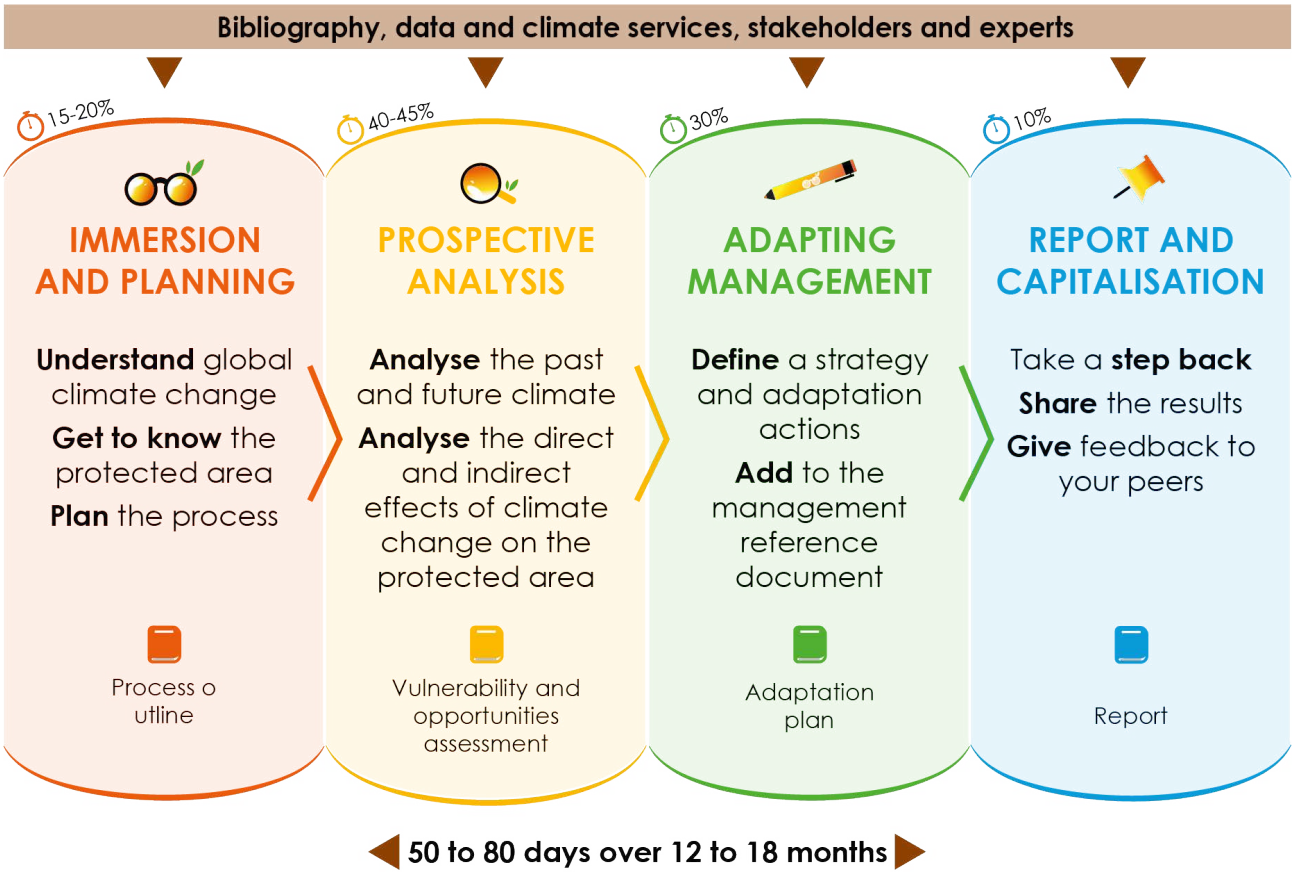
Proposals to adapt to your context

The guide provides you with various tools and methods that have been tried out in practice but which may not correspond exactly to your situation : **you are free to adjust them to suit your context, your objectives and the resources** you have available to carry out the process.

If you would like to share your experience of this method, what you thought of it, what you used (or didn't use), what you adjusted to your context, you can do so by email (naturadapt@rnfrance.org) or by taking part in the discussions of the group « *Gestionnaires intéressés par la démarche d'adaptation Natur'Adapt' ('Managers interested in the Natur'Adapt adaptation process* » on the collaborative platform naturadapt.com, also developed as part of the LIFE Natur'Adapt project.

Process phases

*The Natur'Adapt process is based on a **series of questions centred on four main phases,** represented in the diagram below*



Natur'Adapt process phases

Phase 1
Immersion and planning

Objectives:

- Immerse yourself in the theme of climate change and its main impacts on nature, from a global to a regional scale.
- (Re)immerse yourself in the fundamentals of your protected area and its main characteristics.
- Structure and plan your process, in particular pre-identify the objects of analysis for the four components.

Output:

A project outline of the protected area's process for adapting to climate change, including, for example, a brief presentation of the protected area, the objectives and scope of the process and its planning.

Phase 2
Prospective analysis

Objectives:

- Analyse the past and future climate of the protected area.
- Analyse the direct and indirect effects of climate change (via changes in human activities) on natural heritage and the way it is managed, and determine the vulnerability of the protected area.

Output:

Assessment of the vulnerability and opportunities of the protected area, including a 'climate report' (i.e. a summary of the climate analysis) and concluding with a 'prospective report' (i.e. a summary of the effects of climate change on the protected area).

Phase 3
Adapting management

Objectives:

- Define a strategy and actions for adapting to climate change and the framework for monitoring and evaluating them
- Input the results of the vulnerability assessment and the adaptation plan into the protected area management reference document

Output:

Adaptation plan for the protected area to adapt to climate change.

Phase 4
Report and capitalisation

Objectives:

- Take a step back from the work accomplished and the progress made
- Share the results with stakeholders and provide feedback to your peers

Output:

Report on the process of adapting the protected area.

At each stage of the process, the results and outputs of the previous stage may have to be revisited: the process has an **iterative dimension**, linked to the systemic approach that climate change requires. These iterations are indicated by the icon

During these four phases, there will be many sources of information to refer to: the bibliography, climate data and services, etc. It will also be essential **to inform and mobilise the protected area's stakeholders** : your team, your partners and local players.

Implementing the Natur'Adapt process requires **50 to 80 days of work spread over 12 to 18 months**. That's a lot of work, but you won't be able to do it all. Sometimes you will have to put things aside for lack of time or knowledge. You may find this frustrating, but it is possible and advisable to add to the process and the results regularly, depending on the resources and new knowledge available.

The Natur'Adapt process is not a scientific study, but a process of questioning and reflection. The answers to these questions will be based on the literature and on what experts have to say. You may find that your answers are sometimes incomplete, but that in no way detracts from the value and relevance of your work.

Feedback shows that **the process of moving forward is just as important as the results.** The Natur'Adapt process is a **learning process:** integrating climate change into our way of thinking (or 'putting on our climate change glasses') is an end in itself!

Finally, implementing the process is also an **emotional journey:** anxiety about the climate; anger at the slowness of the necessary changes; frustration at not being able to study everything; but also joy and pride at making progress in the right direction, creating a multi-stakeholder dynamic and becoming part of a community.

Lessons learned and personal accounts

Here are a few lessons learned and personal accounts from the implementation of the Natur'Adapt process in the 21 protected areas that took part in the project.

Adapting to climate change is a process which:

Is prospective

This means looking to the future, with many **uncertainties** linked to climate change and its effects on our natural heritage and human activities.

« I feel like I've taken the first step in a long-term process. It's the start of something that will continue. »

Is qualitative

We work on **trends** and **What experts have to say.**

Is iterative

whenever we make progress, we often need to revisit the results of previous stages, because of the many interactions between components and improvements in knowledge.

Is ongoing

there is no end to adapting to change!

Is time-consuming

this is because it requires us **to develop our expertise** in climate change and its impacts, **to raise awareness** (internally and externally), and to « **digest** » the results at each major stage.

« this process has been fascinating and surprising. It encourages us to rethink and move towards more integrated local management. »

Shakes things up

The future climate and its effects on a protected area may arouse strong **emotions** and **call into question** certain management practices and even certain objectives.

« The process requires us to be less self-centred, to move from a static vision of management towards an evolving vision of management. »

Creates change

It's a journey, during which we put on
The process requires us to be less self-centred, to move from a static vision of management towards an evolving vision of management. « **climate change glasses** » and change the way we look at the management of our protected areas, but also at our own role and the profession of manager.

« Philosophically speaking, the process of integrating climate change into our management practices is very exciting. It encourages us to consider protected natural areas on a broader scale. »

Forces us to change scale

over time (since we are working on the basis of projections to 2050–2100), **spatially** (since several analyses are carried out on the scale of the socio-ecosystem, and certain adaptation actions are envisaged outside the perimeter of protected areas) and **intellectually**.
(we have to take a step back!)

« Climate change provides an opportunity to change the way a reserve relates to its neighbours and to encourage dialogue and cooperation. »

Is a source of opportunities for protected areas

It allows us to **anticipate**, rather than suffer; to give **impetus** to internal and local dynamics, and to create **new links** with colleagues and local stakeholders.

Indispensable!

« Our work shows that it's possible and even imperative to anticipate and prepare for change intelligently and calmly. We need to adapt our modes of governance and our relationship with nature now. »

Finally, before you get started, here is some advice from managers who have implemented the Natur'Adapt process:

« Don't hesitate to take the plunge. Whatever happens, it will be interesting and beneficial. It's an opportunity to step back a bit and take stock of the conservation of your site and how it's being managed, now and in the future. This approach allows you to question yourself, to change certain aspects of your current process and to strengthen others. »

« Develop/use a network of complementary skills. »

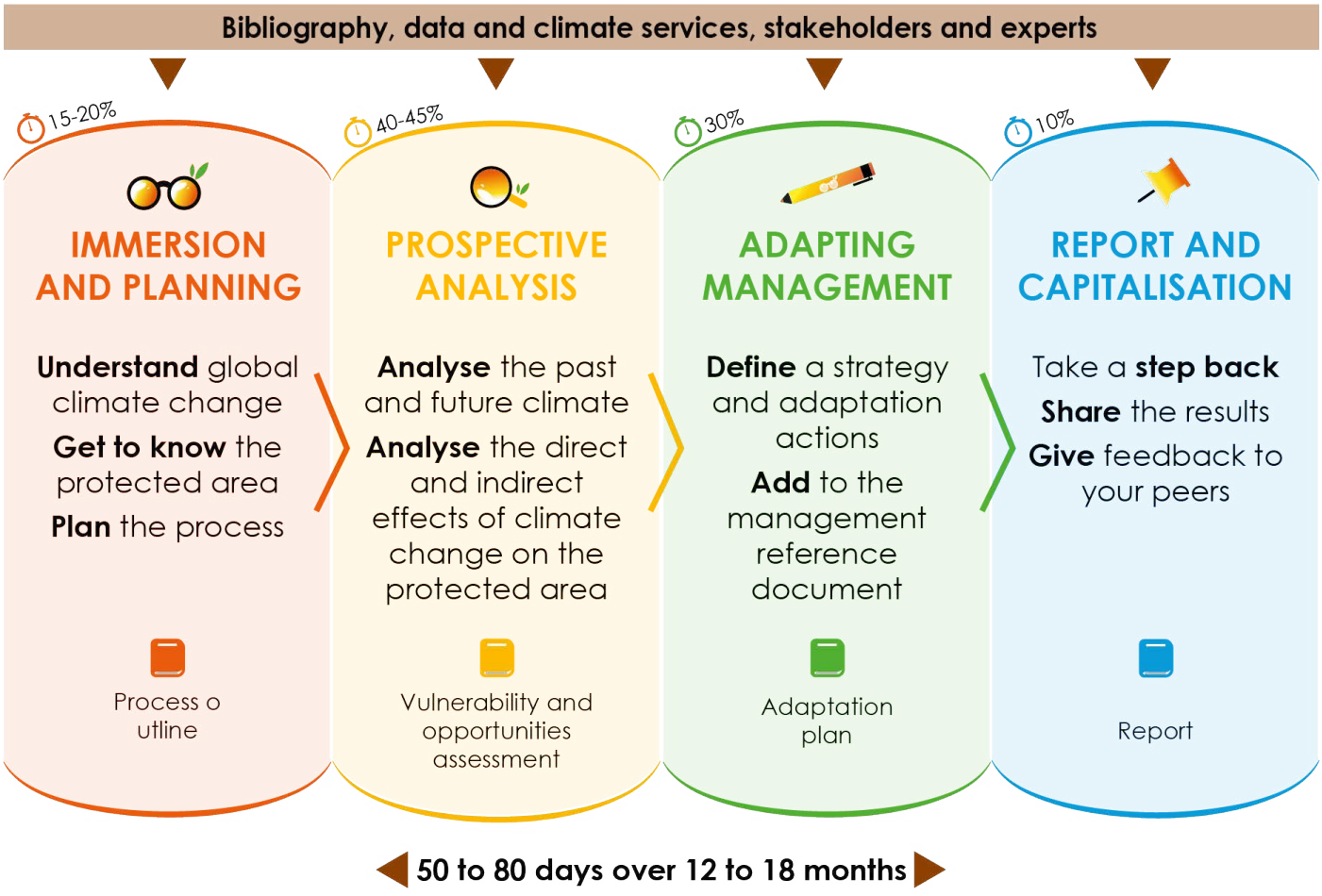
« Don't be afraid to step out of your reserve, go out and meet the people involved and share the whole process with the region. »

« Don't neglect the time needed to change and evolve your vision of the protected area: starting with awareness of the impacts and ending with a paradigm shift! »

« My advice is more of an invitation: put on your climate change glasses, and you'll be able to manage uncertainty, you'll be fine. »

Immersion and planning

Natur'Adapt methodological guide to adapting to climate change


Bibliography, data and climate services, stakeholders and experts
15-20%
IMMERSION AND PLANNING
Understand global climate change
Get to know the protected area
Plan the process
Process o utline
40-45%
PROSPECTIVE ANALYSIS
Analyse the past and future climate
Analyse the direct and indirect effects of climate change on the protected area
Vulnerability and opportunities assessment
30%
ADAPTING MANAGEMENT
Define a strategy and adaptation actions
Add to the management reference document
Adaptation plan
10%
REPORT AND CAPITALISATION
Take a step back
Share the results
Give feedback to your peers
Report
50 to 80 days over 12 to 18 months

Immersion

Objectives

The « immersion » section of this phase is designed to:

- **Gain a better understanding of the global phenomenon of climate change** and its main effects on nature
- **Understand and summarise the characteristics of the protected area** (its four components): its climate; the human activities present (including in its interdependence zone); its natural heritage and the management actions and resources implemented.

« It's important to take the time to fully understand the issues surrounding climate change to be able to explain the phenomenon and its expected effects to others. This is very useful for engaging other stakeholders. It also enables you to identify the structural climate indicators for your site or region. This is the starting point for the adaptation process. »

How do you go about it?

Numerous resources are available on the "*protected areas and climate change*" portal developed as part of the LIFE Natur'Adapt project.

In particular, you will find *examples of climate change adaptation* initiatives carried out in protected areas.

1. By learning about climate change and its effects at global, national and regional level to get to grips with this new subject and learn about global trends.

You can find this information by studying various regional, national and international bibliographical sources on climate change and its impact on nature.

2. By immersing yourself and learning about the characteristics of your protected area (if you don't already know them off by heart), to begin an initial exploration of itss **four components:**

For the « climate » component: this involves documenting and describing the current and past climate of the protected area; and identifying any local sources of information on the climate (local weather stations, climatologists, monitoring centres, etc.) that you can consult for the prospective analysis phase.

> *Climate change helps us to have this systemic vision, including by taking into account what is happening in the protected area's zone of influence. This reinforces the importance of also working beyond its perimeter.*

For the « human activities » component,
document and describe human activities within the protected area and its interdependence zone, and identify the key players and any local initiatives with which your adaptation process can be linked.

THE INTERDEPENDENCE ZONE

A-Z

This covers a wider area than a protected area, with which it maintains close relations (positive or negative): the natural environments and activities present in an interdependence zone directly or indirectly influence the natural heritage, management and human activities of a protected area, and conversely, the natural environments and activities present in a protected area can influence the interdependence zone.
The boundaries of an interdependence zone correspond to a geographical area whose definition takes these various interactions into account.

For the « natural heritage » component, the aim is to document and describe the natural heritage of the protected area, and to identify the experts (internal and external) who could potentially be involved in the process.

For the « management actions and resources » component, the aim is to document and describe the management actions and resources currently implemented in the protected area, and to identify colleagues and partners involved in the management of the protected area who can be mobilised for the process.

Main sources of information

The management document for your protected area contains a great deal of information that is essential for this immersion phase. Similarly, **your management team** will have a wealth of invaluable knowledge at their disposal.

You can also identify and consult **experts** (climatologists, ecologists, etc.) and **local players** (foresters, farmers, tourism professionals, local authorities, local residents, etc.), who are also stakeholders that you can involve throughout the process.

Finally, for the climate, regional and **local monitoring centres and expert groups**, if they exist in your area, or **climate services** are also useful resources. They offer analyses and summaries of changes in the local climate and their impact on different sectors of activity, in which you can find useful information.

To help you with this step, see factsheet 1, « Exploring the four components ».

Planning

Objectives

The « planning » part of this phase aims to **define and plan** your process for adapting to climate change by defining, in particular:

- Your objectives
- Your scale of analysis
- Your initial selection of « objects of analysis »
- Your governance
- The main stages and actions to be taken, and the timetable
- The resources to be used
- Links with other initiatives under way in the area

Be careful not to start the analyses during the immersion and planning phase. This is an initial process which will be refined later, during the prospective analysis phase!

How do you go about it?

1. Define your objectives and the spatial scale on which you plan to adapt

Defining your objectives means answering the question, "Why should we embark on a process to adapt to climate change?" **Your objectives will then guide the choices to be made in the subsequent phases** of the process, as well as the ambition you wish to give to your process, depending on the resources at your disposal.

You also need to **define the scale at which you are going to carry out your process :** at the scale of the protected area or of certain sectors? The protected area and its interdependence zone? A network of protected areas?

> *An organisation that makes An commitment must think carefully at the outset about what it is committing itself to and what it wants to achieve.*

> *The time devoted to implementing the process must be adapted to the context of the region, and also to the goals that the manager sets at the outset.*

Depending on the size of the protected area, you can target or extend the areas to be covered by the vulnerability analysis. For example, you could concentrate on the core zone of the park or target a priority area in terms of functionality (water filtration, bird nesting, etc.). You may also decide to 'start' your analysis in one area of your protected area and then target other areas to be analysed at a later date, as you are starting an adaptation process but adapting to climate change is a never-ending process.

2. Select a panel of objects for analysis that reflects the challenges facing the protected area

Once the objectives and scope of the analysis have been set, you can make **an initial selection of objects for analysis** (ideally between 20 and 30) representative of the four components 'climate,' 'natural heritage,' 'human activities' and 'management actions and resources.' These objects are the most structural elements, the most meaningful for your protected area. It is these 'objects of analysis' that you will analyse in the next phase of the process.

As the manager or facilitator of the adaptation process, you and your team are relevant and entitled to make this selection. You can also involve your governance bodies (scientific council, commission, etc.) in making and validating this initial selection: this will make your choices more robust and enable your partners to take greater ownership of the process.

Some recommendations for making this selection

Choose elements in the component that are characteristic, representative and/or provide structure for the protected area, as well as symbolic elements that speak to local stakeholders.

For the « climate component »

Choose the climatic parameters and indicators that provide the most structure for your protected area (those that make your protected area home to a particular ecosystem and not others).

For natural heritage

Don't try to select elements that are in principle vulnerable to climate change, but rather those that are important for the protected area at a given moment.

It is often necessary to group species together (cold-climate species, shorebird species, etc.) and to look at habitats/environments and ecological functions.

It is important to **document and explain** the choices made: why choose this or that species or activity rather than another? This helps to justify the initial selection.

This list of objects of analysis will evolve during the process: don't hesitate to add or drop them, changing the scale of analysis, grouping them together or pointing out a lack of knowledge, etc.

« When looking ahead and assessing vulnerability, it is not necessarily easy to work at species level. There are too many of them, and they sometimes obscure the importance of the processes that link them. We have chosen to work at habitat, species group or process level. »

3. Choose who to work with

Adaptation is not something you can do on your own: from the outset, it's essential to think about which **stakeholders** you need to mobilise and involve in the various phases of the process.

You can involve different categories of stakeholders for different purposes: obtaining or passing on information, getting them to contribute to certain stages of your process, or validating results or actions.

You therefore need to think about the following:

Who should you involve? The protected area team (colleagues), your governance bodies (scientific council, management committee, etc.), the protected area's partners and local stakeholders (elected representatives, socio-professionals, local residents).

You can represent the stakeholders in the form of a **stakeholder diagram**, e.g. according to their affinity with climate change, their influence on the protected area or their involvement in the area.

> *« I recommend involving your colleagues, the reserve's partners and scientific experts, and maintaining good contacts with people on the ground to be able to adapt to climate change together. »*

Why should you involve them and what in? It is useful to determine what you expect from the stakeholders you are going to approach: is it to inform them about your process, collect information, obtain their perceptions of climate change, etc, and to define the expected level of involvement (informing, dialogue, joint decisions, etc.)?

> *« It's also better not to be alone in the process. Networking has enabled us to exchange ideas, share questions and combine ideas, discuss the choices to be made. »*

How do you involve them? There are several possible methods: online surveys, two-way interviews, multi-stakeholder workshops, conferences, etc. It will be essential to take into account the level of knowledge and the degree of familiarity with climate change among the stakeholders concerned, to ensure that there is a good level of mutual understanding.

You can draw up a dedicated document, planning the mobilisation and involvement of the various stakeholders you have identified, which will serve as a **roadmap for mobilisation.**

> *« Mobilising and raising awareness among stakeholders takes time [...] but it enriches the process and can make it easier to take ownership of the results. »*

Informing and mobilising people can be time-consuming : choices have to be made between the ambitions for mobilising stakeholders, the resources and the time needed for the process. It is also worth exploring the possibilities of integrating into existing initiatives in the area.

For more details, see factsheet 2, « From information to mobilisation ».

Get involved with other protected areas!

Why not work with other protected areas that are close to you or have similar environments, for instance? This could enable you to **pool resources and analyses and enrich your thinking. The collective dynamic** of the six, then 15, protected areas that have implemented the Natur'Adapt process has been a major factor in its success. In Occitania, five nature reserves have also made a collective commitment, demonstrating the benefits of working together.

4. Identify current initiatives in the area and make provision for links with your own initiative

Initiatives to adapt to climate change or planning initiatives, such as water development and management schemes or local urban development plans, may exist or be planned in and around the protected area.

It is important to take an interest in these processes, as they may affect your protected area. If you are aware of them, you can check whether the protected area is mentioned in them and study how your own adaptation process could fit in with them.

The initiators of these initiatives can also be included among the stakeholders to be contacted or mobilised. The opportunity to carry out joint initiatives (communications, dialogue meetings, etc.) should also be considered.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How do you go about it?

5. Plan the process

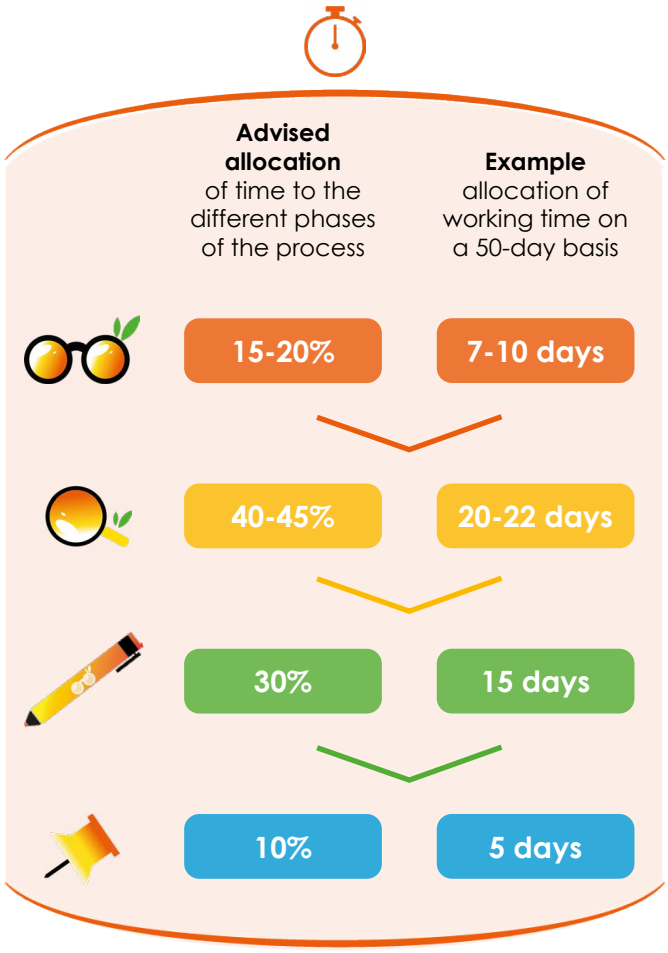
This involves:

Planning over time the different phases of the process (establishing a timetable), paying particular attention to:

- Times for mobilising stakeholders
- Times for validating the key outputs of the process by the governance bodies of the protected area and/or the management body.

Evaluating the time required to work within the protected area team (e.g. Project manager, conservationist, trainee, etc.) According to the planned schedule.

Possibly reviewing the above elements in light of the resources actually available.



Some recommendations to plan your process

Between each major stage in the process, it is advisable to take a 'break' to 'digest' the information and results obtained and take a step back before the next stage. For example: after the immersion (time for getting used to climate change), after the analysis of climate change (time for accepting and appropriating the results), after the analysis of changes in natural heritage (time for accepting the results and what they may call into question in terms of management), etc.

In the prospective analysis phase, it is important to be aware of **the balance of time allocated to the 'climate' component and to the other three components.** Exploring climate data can be time-consuming: this should not be to the detriment of the analysis of the other components. In reality, trends are sufficient in most cases!

The iterative approach of the process should also be taken into account: we often return to the results of the previous stage.

« There needs to be time for reflection to mature. »

« In the time allocated to the process, you need to find a balance between phases where you are totally immersed and time to digest each stage. »

Set a pace that strikes the right balance between the process and the other tasks of the protected area.

Remember to plan how the process will fit in with your management document. The results of your process need to be incorporated into your management document sooner or later. This can be done during the process if it coincides with the revision of your management document, or at a later date.

Don't underestimate the time needed to mobilise the stakeholders and validate the outputs from the various phases of the process by the governance bodies of the protected area and/or the management body.

> *« You have to prepare for the process and anticipate and prepare the people involved [...]. The time needed for dialogue should not be underestimated, especially in a complicated context. »*

6. Draw up and validate your project outline

You can set out all the planning elements in a project outline, the aim of which is to set out the guidelines for your adaptation process, which will serve as a point of reference.

The project outline can include:

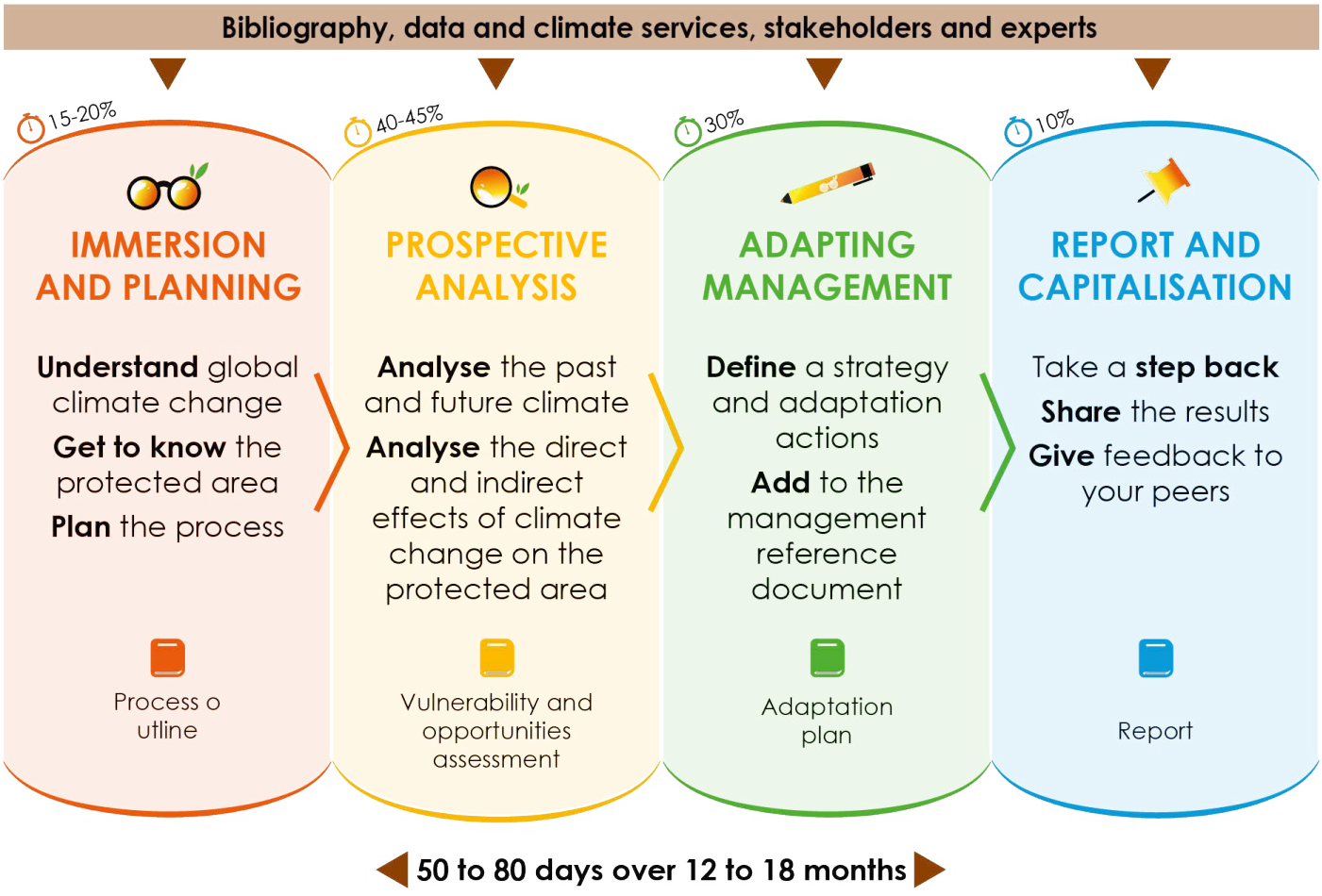
- **A brief presentation** of the protected area and its four components
- **The scope of the process** (spatial scale, ambition, initial selection of 'objects of analysis,' etc.)
- **The planning of the process** (governance, main stages and actions, timetable, resources mobilised, etc.)
- **Links** with other existing initiatives in the area.

The project outline can be shared with and validated by your governance bodies, to facilitate ownership of the process and prepare for any future requests.

Some elements of your project outline may change during the course of the process, in particular the list of objects to be analysed. To avoid multiple versions, we recommend that you finalise the project outline at the end of this immersion and planning phase and that you record the list of objects of analysis in another working document, which can be amended throughout the process.

Prospective analysis

Natur'Adapt methodological guide to adapting to climate change


Bibliography, data and climate services, stakeholders and experts
15-20%
IMMERSION AND PLANNING
Understand global climate change
Get to know the protected area
Plan the process
Process o utline
40-45%
PROSPECTIVE ANALYSIS
Analyse the past and future climate
Analyse the direct and indirect effects of climate change on the protected area
Vulnerability and opportunities assessment
30%
ADAPTING MANAGEMENT
Define a strategy and adaptation actions
Add to the management reference document
Adaptation plan
10%
REPORT AND CAPITALISATION
Take a step back
Share the results
Give feedback to your peers
Report
50 to 80 days over 12 to 18 months

General principles

Phase objectives

Remember that prospective analysis involves **imagining possible futures in order to inform present-day choices**. It's an intellectual process, a **time for reflection to look to the future in a reasoned and holistic way**. It enables us to **anticipate rather than suffer,** and to guide our decisions towards a **desirable future.**

The aims of this phase are to analyse the past and future climate of the protected area and then to analyse the direct and indirect effects of climate change (via changes in **human activities**) on its **natural heritage and management**. This enables an **assessment of the vulnerability and opportunities** of the protected area to be drawn up, which will serve as a basis for adapting the actions and management resources of the protected area.

The proposed analysis is not **a scientific study**. It is based on the state, at a given time, of available knowledge (including expert opinion) and projections relating to climate change and its impact on the protected area. It is neither exact, certain nor fixed.

However, it can be used to:

- **Identify trends** so that decisions and action can be taken
- **Identify gaps** in knowledge
- **Be enhanced** a posteriori, on an ongoing **basis**
- **Share** the adaptation process and issues **internally and externally**
- **Start putting on your 'climate change glasses!'**

Questions that will guide you

The prospective analysis focuses on **a selection of objects of analysis representative** of the four main components of the protected area (climate, human activities, natural heritage and management actions and resources).

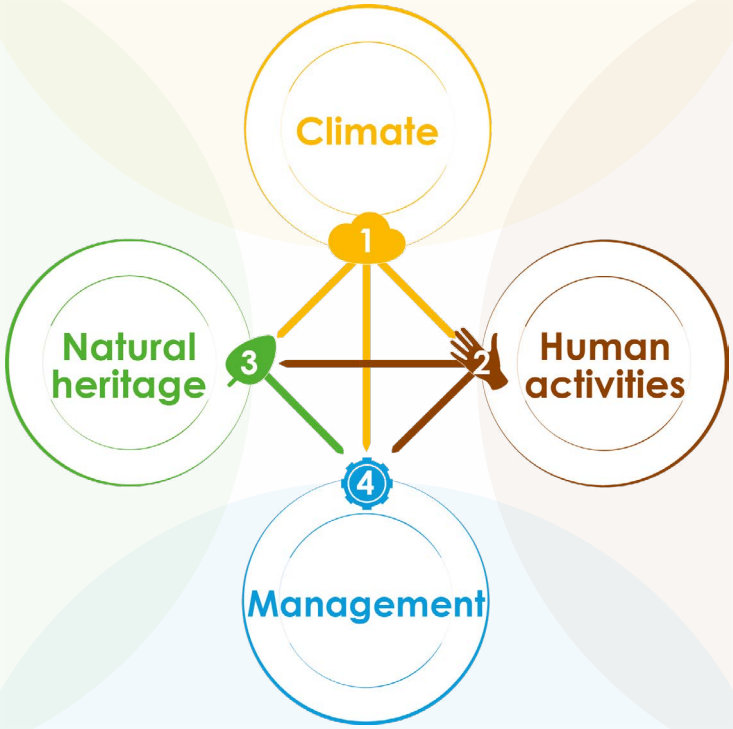
We suggest basing your analysis on the following questions:

1 How has the local **climate** changed in the past and how will it change in the future?

3 What are and will be the effects of climate change and changes in human activity on the protected area's **existing natural heritage**?

What new species and habitats **could arrive** and develop?

What are the **first ways of adapting** to these effects?



2 How have **human activities** evolved and how will they evolve under the impact of climate change?

4 What are and will be the effects of climate change and changes in human activities on the protected **area's management actions and resources** (without adapting)?

How are the **current management** actions and resources **adapted** to a changing climate?

What are the **initial avenues for adaptation?**

As the four components are highly interdependent, it is necessary to compare the analyses on a regular basis, using **iterative loops to take account of interactions**: each analysis for a component may lead to a partial revision of the previous one.

For each component, we need to look at both the past (observations) and the future (projections), as the former can already give indications of the latter, as climate change has now been under way for decades.

Main stages of analysis for each component

For each component, you need to:

Refine the initial list of objects for analysis drawn up during the immersion and planning phase, in particular with regard to the results of the previous analysis(es)

Collect information on the objects of analysis (in particular information that will subsequently be used to analyse how they will evolve under the impact of climate change) using the bibliography, expert opinion and local involvement.

Analyse this information (simple or detailed analysis, object by object), if possible in a group (with experts, colleagues, etc.) **and imagine** how the objects of analysis could evolve in the context of climate change.

Share and consolidate the results of the analyses with the stakeholders concerned and **approve** them with the protected area's governance bodies (if necessary), depending on the choices made during the planning phase.

The two levels of analysis proposed

Each component can be analysed in greater or lesser depth. For example, you could carry out a detailed analysis of the future climate and quickly outline the potential evolution of human activities. **It is up to each leader of the process to choose** the desired and possible **level of detail,** depending on his or her context, in particular the time and information available, but also the ambitions defined during the planning phase.

For each component, **two levels of prospective analysis** are proposed in this guide: simple or detailed. If neither is suitable for you, feel free to find your own approach and adapt these suggestions.

Simple analysis	
Analysis of regional trends	**Analysis of potential effects**
Detailed analysis	
Detailed analysis of the local climate	**Analysis of vulnerabilities and opportunities**

Summary table of the two levels of analysis proposed for each component

For the «human activities», «natural heritage» and 'management actions and resources' components, **a common factsheet of standard questions to ask is proposed for:**

- **Analysing the potential effects** on the objects selected (simple analysis). This analysis makes it possible to carry out a general forecast without going through the various components of the vulnerability.

  Factsheet 5

- **Assessing the vulnerability of the selected objects** (detailed analysis). This analysis requires a thorough understanding of the objects and enables us to 'unpack' how each object may be impacted by change.

  Factsheet 6

A-Z

Potential effects

The potential positive or negative repercussions of climate change.

Vulnerability

The susceptibility of a socio-system or ecosystem to damage, depending on its exposure, sensitivity and overall capacity to adapt to climatic variations (and their physical consequences).

Exposure

The nature, degree and frequency of climatic variations (and their physical consequences) likely to be experienced by human or natural systems.

Opportunity

An element through which a socio-system or ecosystem will respond positively to climate change.

Sensitivity

The tendency of a socio-system or ecosystem to be affected (favourably or unfavourably) by climatic variations (and their physical consequences).
Examples of climatic variations: increase in average annual temperatures, decrease in the number of days with frost, etc.
Examples of physical consequences: increase in droughts, decrease in river flows, rising sea levels, etc.

Adaptability

The quality(ies) that enable a socio-system or ecosystem to reduce the negative effects and/or take advantage of the positive effects of climate change.

In each of the following sections, you will find examples of how these factsheets can be applied (tables pages 35–36, 39–40 and 45–46).

Warning: Given the uncertainties associated with climate change and the response of natural systems, it is important to document the following:

- The **justifications and assumptions** underlying the choices and results
- **Sources** of information (bibliography, stakeholders interviewed, etc.)
- The degree of confidence in the proposed analysis (based on current knowledge!).

This will help you to objectify expert opinion (including your own) and uncertainties, since the prospective analysis is based on projections and state-of-the-art knowledge, both of which are subject to change.

Some recommendations to help you determine the scope of this phase

Choose to analyse a limited number of objects (20 to 30): the aim is to draw up a global and representative vision of the future of the protected area. (You don't need to know everything, you need to know what matters and what provides structure). What's more, carrying out the analysis on a few objects relating to human activities, natural heritage and the management of this heritage gives an idea of the investment involved. It is then possible to analyse the vulnerability of other elements and to add to the assessment as the process unfolds and is implemented.

Consider the size of the bibliography, to avoid getting lost in the collection and analysis.

Use what experts have to say (researchers, local players, colleagues): this provides a shared analysis of vulnerability and can be less time-consuming than carrying out bibliographical research on your own.

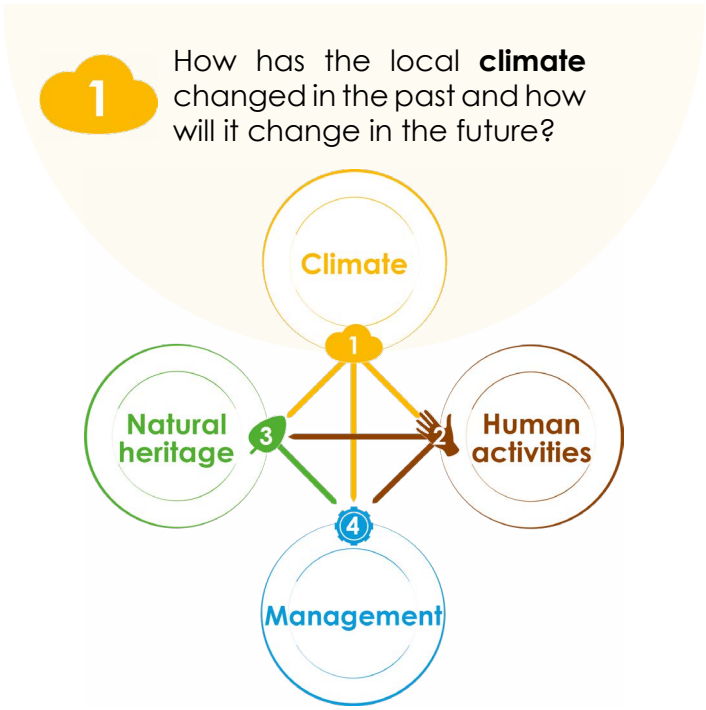
But be careful to adjust the number of people involved in gathering information to the time available! The time required to mobilise stakeholders should not be underestimated.

Draw on the experience and products of protected areas that have already implemented the Natur'Adapt process, to save time.

Stage 1 – Climate analysis

Objectives

The aim is to **analyse the past and future climate of the protected area** and its interdependence zone, and to produce **a summary to be shared in the form of a climate report** for the protected area.



This is an essential step in understanding the past (observed) and future (estimated) effects of climate change on the protected area. It indicates what we need to adapt to and prepare for.

Understanding climate change then enables us to analyse the direct and indirect impacts on the other three components of the protected area.

It is essential to start putting on your « **climate change glasses!** »

Weather, climate and climate change: what's it all about?

A-Z

Meteorology is the study of atmospheric phenomena to produce short-term forecasts. It provides answers to questions such as: «What will the weather be like tomorrow or this weekend?» Weather forecasts can be made on a timescale of a few days to two weeks.

Climate is defined as the probability of occurrence of various weather conditions **for a given region over a long period of time.** Climate normals are generally calculated over 30-year periods.

Current climate change differs from past climate variations in **its intensity, speed and origin.** Anthropogenic greenhouse gas emissions are largely responsible for **global warming and the disruption to the current climate.**

How accurate should analyses be?

A detailed analysis of the protected area's climate is not essential for understanding the potential effects of climate change on nature or its vulnerability. Broad trends for the main parameters and indicators are often sufficient, as the possible responses of nature are still unclear. For example, current knowledge does not indicate whether a local increase of +2.2 or +2.5 °C makes a significant difference in terms of vulnerability for most species. The key thing is to understand the trends in climate change and how they will affect living organisms (shifts in phenology, physiology, etc.).

In addition, feedback from sites that have already taken steps to adapt to climate change warns of the **risk of getting bogged down in** time-consuming **data and detailed analyses.**

However, if you want to carry out a detailed analysis and if you have the time to devote to it, it is often a rewarding and instructive task. Whatever your choice, **the climate expertise acquired during this stage is of benefit** when it comes to meeting local players, who themselves want information on climate change.

How do you go about it?

There are several options for analysing climate change in your protected area, depending on the time you have available and your 'appetite' for climate data and the services that can provide it (climate services).

It is also possible to call on the expertise of a service provider, if you don't have the time and/or inclination to carry it out yourself. Make sure you retrieve the raw data (in case you need to redo the analyses) and take full ownership of their work so that you can present it yourself and use it in the subsequent stages.

Here are the main steps to take.

1. Refine the choice of climate parameters and indicator

The aim is to refine the initial selection of climate parameters and indicators made during the immersion and planning stage.

Climate parameters and indicators

The main climate parameters used for climate analyses are those relating to the state of the atmosphere: temperature and precipitation. These are then broken down into a large number of indicators, for example:

For temperature

average annual temperature, maximum and minimum temperatures, number of hot days, days with frost, etc.

For precipitation

annual average, spring cumulative total, summer cumulative total, annual number of rainy days, number of snowy days, etc.

Other indicators are also useful for understanding the impacts of climate change, such as evapotranspiration, indicators linked to hydrology, and for marine sites, indicators such as sea levels, water pH, water column temperature, etc.

Some recommendations to help you choose your climate parameters and indicators

The aim is to select as a priority the **structural parameters of the protected area** in question, i.e. those which determine the existence and functioning of your site, as well as those which you believe a priori to be important for the objects of analysis of the other three components. These structural parameters and indicators **are specific to each site** depending on its characteristics (mountain, alluvial, coastal, marine, etc.).

Another important criterion is **data availability**. In fact, climate analysis calls for access to sufficiently numerous, reliable and old data to study the past climate, as well as data taken into account in modelling the future climate.

Some indicators will only be needed for your analyses, while others will **make it easier to communicate with local stakeholders,** as they are more meaningful and easier to communicate with. It is useful to bear these two objectives in mind when choosing your climate indicators

2. Collect your climate data

There are two types of climate data:

Observed data | is data measured by weather stations

Modelled data | is data calculated using complex mathematical models representing the climate system and its various components

Data for the past and present climate may be measured data or modelled data (depending on whether or not measurement stations exist). Data for the future climate are necessarily modelled data. These are known as future climate **projections**.

To collect your climate data, you can use the following:

- A **local weather station**, if there is one close to your protected area and it has reliable data for at least 30 years
- Any **existing local or regional studies**, where you can find 'turnkey' climate studies
- The climate services available in your country, which can provide you with data, graphs and summaries.

How do you go about it?

For your analysis of the future climate, you will need to make a number of choices over and above the climate parameters. In particular, you will have to choose **the emission scenarios, the time frames and the climate models** with which you want to obtain your data.

Here is some essential information to help you make your choices:

Reference periods for climate analysis

Climatology requires long-term data. To characterise the present climate, a minimum period of 30 years is recommended by the World Meteorological Organization. To identify changes in the climate, we therefore need a series of measurements extending beyond 30 years, the ideal being 60 years of data to compare two 30-year periods.

To measure climate change since the industrial revolution, it is advisable to refer to the period from 1961 to 1990 (the World Meteorological Organization's baseline). At that time, the consequences of anthropogenic greenhouse gas emissions were not yet visible and the measuring instruments were considered to be reliable.

Emissions scenarios

RCP (Radiative Concentration Pathway) emission scenarios correspond to the various greenhouse gas emission scenarios proposed by the IPCC (Intergovernmental Panel on Climate Change). An RCP is used as an input parameter for climate models. Its value can be associated with assumptions about socio-economic trends, but also with adaptation and mitigation policies.

Time frames

Climate models provide indicators for different time intervals (often 2030, 2050, 2100) or time frames (i.e. ranges of years). Given the uncertainties associated with climate models, the advantage of time frames is that they don't suggest that a particular temperature will prevail on a particular date, but rather that «it is possible that in a particular period, the range of possible temperatures will be as follows...»

Climate models

Several climate models exist and differ according to the calculation method used and the country. Some models may be optimistic (giving more optimistic results than other models) or pessimistic (giving more pessimistic results than other models).

In view of these specifics, it is essential to try to obtain a range of values, which allows the uncertainties associated with the modelling to be taken into account. **It is generally advisable to use several models** and compare them with each other. For example: a model considered to be pessimistic (such as CNRM CM5 / Aladin63), a model considered to be optimistic (such as IPSL CM5A / WRF381P) and the median of all the available models. The latter is often situated between the other two models, but is sometimes more pessimistic, with forecasts of greater warming or less rainfall.

The concept of uncertainty and how it is taken into account

Future climate projections are **projections**, i.e. they are trends or trajectories that are not certain. There are several sources of uncertainty:

- **Uncertainties linked to the natural variability** inherent in the climate system, due to the interactions between the various components of the climate. This natural variability can temporarily mask the effects of climate change in the near future.
- **The uncertainty of the climate models themselves** (differences between models). The level of uncertainty linked to the models is much greater for precipitation than for temperature.
- **Uncertainties linked to socio-economic scenarios:** we don't yet know what our future greenhouse gas emissions will be, as this depends on the socio-economic trajectories we choose to follow.

When analysing the future climate, these uncertainties must always be borne in mind. It is generally advisable to **work with several climate models and/or several scenarios, in order to propose ranges for changes** in climate parameters.

3. Analyse climate data

Data analysis involves **calculating or graphically representing** (curves, histograms, etc.) averages and extremes for the various parameters and indicators selected for the protected area, according to the relevant time frames (annual, seasonal, monthly, etc.) that you have identified.

This will enable you to draw up the **climate study** for the protected area, which aims to give an account of past, present and future climate trends.

If you have the opportunity, you can have your climate study checked by climate experts.

4. Summarise and share the results: the protected area's climate report

It is advisable to draw up a climate report for the protected area **to summarise and share the results of the climate analysis.**

The climate report **will present the main trends** in order to reproduce and share the climate analysis in a simple and communicative way with the stakeholders involved in managing the site.

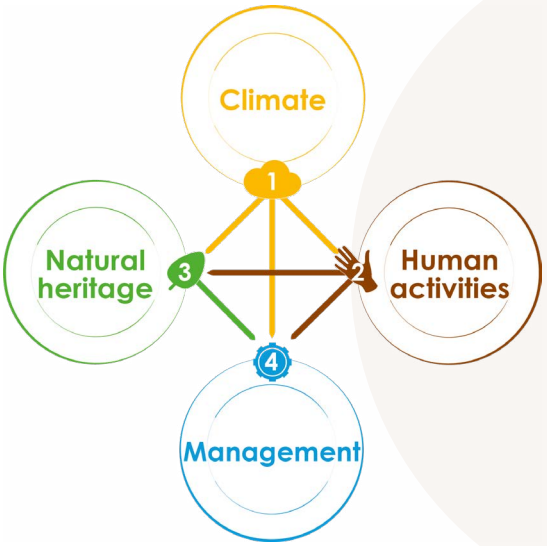
It can take a variety of forms: slide show, summary with graphs, maps representing expected trends, posters, tables, written text, etc.

Stage 2 – Analysis of the other three components

« Human activities » component

Objectives

his stage involves analysing the evolution of human activities in and around the protected area as a result of climate change, which may have an effect on the natural heritage and the way it is managed.



2

How have **human activities** evolved and how will they evolve under the impact of climate change?

Why analyse changes in the local climate?

Human activities in and around a protected area are often numerous and can have an influence on natural heritage, which can be positive or negative. It is therefore important to consider how these activities are changing, particularly in relation to climate change. Human activities will also evolve under the effect of climate change and their impact on natural heritage will be altered: these are the indirect effects of climate change on nature.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How do you go about it?

1. Refine the list of human activities (pre-identified in the immersion and planning phase) to be analysed in the light of the results of the climate analysis.

2. Collect information on the selected human activities and their **past and future** evolution under the effect of climate change using the **bibliography** (management documents, sectoral studies, etc.) and by **mobilising stakeholders** (surveys, interviews, workshops, etc.).

3. Analyse this information object by object (analysis of vulnerability or potential effects), then **cross-analyse** (to take account of possible interactions between objects), if possible **collectively** (with experts, colleagues, etc.) **and imagine** how human activities might evolve in the context of climate change.

NB: Remember to specify the sources of information and the levels of uncertainty.

- Suggested sheets of standard questions to ask yourself are provided for the two levels of analysis: ***factsheets 5, 'simple analysis' and 6, « detailed analysis ».***
- Two hypothetical examples of analysis are given on the following pages.
- The analysis may lead to a review of the list of objects in the other three components.
- The results of this analysis will feed into the analysis of changes in the natural heritage and management.

4. Share and consolidate the results with those involved and **validate** them with the governing bodies of the protected area (depending on the choices made during the planning phase).

It is essential to mobilise stakeholders to gather their observations, potential effects and avenues for adaptation. **But the aim is not to assess their vulnerability for them!** The aim is to understand the future evolution of human activities in order to anticipate the indirect effects on the natural heritage of the protected area and the way it is managed.

As a reminder, factsheet 2, « From information to mobilisation », is available to help you.

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Hypothetical example of simple analysis (potential effects) of a « human activity » object

2	Object of analysis		Observed effects	Potential effects of climate change		Potential adaptations	
Activity	1. **Why** did you choose this object?	2. What are its **main characteristics** within the chosen analysis perimeter?	3. What **effects** of climate change have **already been observed** on the object?	4. How will the main **parameters and climate hazards** influencing the object evolve? *To be included in climate analysis*	5. What are the **potential effects** of this future climate on the object?	6. What are the main **external** (non-climatic) **factors** that could limit or promote the adaptation of the object and how will they change? *Analysis of natural heritage to be included (if resource for the activity))*	7. **How** can the activity be **adapted**? *Results to be integrated into the analysis of natural heritage and management components*
Forestry	Activity with a major impact on water resources and therefore on water supply to peat bogs	Mainly privately-owned forests, located outside the perimeter of the protected area, with rather intensive use of softwoods	Acceleration in the rate of felling due to increased productivity (increase in CO2 levels) and dry soil allowing more machinery to pass through	Increase in atmospheric levels of CO2 Increase in droughts	Positive effect: Doping effect on the increase in CO2 and improved workability of soils Negative effect: Risk of more irregular tree growth and in tree growth and dieback	Wood industry favoured Numerous experiments under way in France	Speed up felling (easy) Planting of new, more suitable species (more costly) Diversification of stands (changes the economic model)
	Justification and source(s)		Interviews with foresters + regional environment monitoring centre	Climate analysis of the protected area	Interviews with foresters and scientific bibliography	Interviews with foresters	PCAET + interviews with foresters
	Level of confidence		Very high	Good	Good	Average	Average

Hypothetical example of detailed analysis (vulnerability) of a « human activity » object

2 Object of analysis			Observed effects	Vulnerability / opportunity in the face of climate change (possibility to stop at question 7)							
Activity	1. **Why** did you choose this object?	2. What are its **main characteristics** within the chosen analysis perimeter?	3. What **effects** of climate change have already been observed on the object?	4. How will the main **parameters and climate hazards** influencing the object evolve? *À intégrer dans l'analyse climatique*	5. **Sensitivity** of the object to these parameters	6. **Anticipated evolution** of these parameters (exposure)? *Cf. analyse climatique*	7. **How** can the activity be adapted? *Résultat à intégrer dans l'analyse des composantes patrimoine naturel et gestion*	8. What external factors can limit or favour the adaptation of the object?	9. How will these factors evolve with climate change?	10. What is the overall adaptability of the object? (7X9)	11. What is the vulnerability of the object (5X6X10)?
Forestry	Activity with a major impact on water resources and therefore on water supply to peat bogs	Mainly privately-owned forests, located outside the perimeter of the protected area, with fairly intensive use of softwoods	Acceleration in the rate of felling due to increased CO2 and dry soil allowing more machinery to pass through	Atmospheric levels of CO2 Drought	Average	Increase in atmospheric levels of CO2 Increase in droughts fairly unfavourable in the medium term	Faster felling (easy) Planting of new, more adapted species (more expensive) Diversification of stands (economic model problem) average	Economic context Research progress, etc.	Encouraging the wood industry Numerous experiments under way in France fairly favourable in the medium term	Average	Average
Justification and sources			Interviews with foresters + regional environment monitoring centre	Interviews with foresters + regional environment monitoring centre	Interviews with foresters + local biodiversity monitoring centre	Climate analysis of the protected area	PCAET + Interviews with foresters	Interviews with foresters	Interviews with foresters	Evaluation with forestry officer	Evaluation with forestry project manager
Level of confidence			Very good	Very good	Good	Good	Average	Average	Average	Average	Average

« Natural heritage» component

Objectives

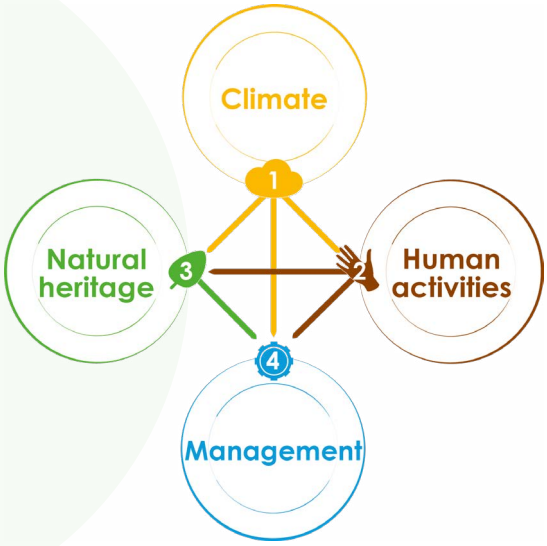
Analyse the evolution of the natural heritage of the protected area due to climate change ('direct effect') and due to the evolution of human activities ('indirect effect').

3

What are and will be the effects of climate change and changes in human activity on the protected area's **existing natural heritage?**

What new species and habitats **could arrive** and develop?

What are the **first ways of adapting** to these effects?



How do you go about it?

1. Refine the list of objects to be analysed (species, habitats, functions, etc.), particularly with regard to the results of the climate analysis and the analysis of human activities.

2. Collect the information, using bibliography (management documents, studies, research, monitoring centres, etc.) and by mobilising stakeholders (surveys, interviews, workshops, etc.), on:

- **The selected objects** of analysis (elements of the natural heritage) and their past and future development under the effect of climate change
- **The species and habitats that could become established**/develop in the protected area as a result of climate change.

3. Analyse this information object by object (analysis of vulnerability or potential effects), then **cross-analyse** (to take account of possible interactions between objects), if possible **collectively** (with experts, colleagues, etc.) **and imagine** how human activities might evolve in the context of climate change.

NB: Remember to specify the sources of information and the levels of uncertainty.

- Suggested sheets of standard questions to ask yourself are provided for the two levels of analysis *(factsheets 5 and 6)*
- Two hypothetical examples of analysis are given on the following pages.
- The analysis may lead to a review of the list of objects in the other three components.

4. Refine the analysis of the evolution of human activities in light of the results for the natural heritage. For example, the loss of certain environments will affect the activities linked to them. (The natural heritage is then considered to be a resource and therefore an 'external factor' in the analysis.)

5. Share and consolidate the results of the analyses with those involved and validate them with the governing bodies of the protected area (depending on the choices made during the planning phase).

Some recommendations to refine your selection

As the manager, you and your team have the right to choose the objects of analysis of the natural heritage, but this choice can also be made with your scientific board and/or your partners. As a reminder, the objects should be chosen from among the **species, habitats, functionalities and ecosystem services** present in the protected area.

Choose **species, habitats, functionalities and services which :**

- led to the selection of your protected area
- and/or are of high heritage value
- and/or are representative of your protected
- area and/or are important in terms of functionality

Don't try to select elements that are in principle vulnerable to climate change, but rather those that are important for the protected area at a given moment.

It is often more practical to **group species together** (e.g. cold-climate species, shorebird species, etc.) and to look at habitats/environments and ecological functions (e.g. sediment transport by river, water quality, etc.). It is often difficult to find bibliographical references on species.

Get to the essentials first (i.e. don't select too many objects!), It will be possible to enrich the analysis of natural heritage objects later, since an adaptation process begins but never ends, and your adaptation plan will certainly contain a 'knowledge enhancement' section.

New arrivals

By analysing changes in climate and human activities, we can envisage the arrival of new species and the development of new habitats for which conditions will become favourable in the future. It is important to anticipate their arrival, as they will form an integral part of the protected area and may represent **threats or opportunities** in the future. One way of thinking about this is to ask the following questions:

- Are there already occasional **sightings** of certain species, usually more southerly, for example?
- What natural area today (but in a different location) has **a climate similar to the climate projected** for my protected area in the future? What species and habitats are present there? Could they develop in my protected area in the future?
- What types of **environment will be favoured** in the future conditions of the protected area and what species could find refuge there?

The bibliography is likely to be brief for this analysis of new arrivals: don't hesitate to consult the experts in the field.

3	L'objet d'analyse		Effets observés	Effets potentiels du changement climatique		Adaptations potentielles	
Object	1. **Why** did you choose this object?	2. What are its **main characteristics** within the chosen analysis perimeter?	3. What **effects** of climate change have **already been observed** on the object?	4. How will the main **parameters and climate hazards** influencing the object evolve? *See climate analysis.*	5. What are the **potential effects** of this future climate on the object?	6. What are the **main external (non-climatic**: human activities, other factors) factors that could limit or promote the adaptation of the object and how can they change? *See analysis of human activities + any other factors (physical barriers etc.)*	7. **How** can the management of this object be **adapted**? *Result to be integrated into the 'adapting management' phase*
Rock Ptarmigan	Threatened species, symbolic of the protected area, conservation issue in the management plan	Mountain bird, nesting on the ground, in the open, relies on the camouflage provided by its plumage ('earth' colour in summer, white in winter	Birds ascending to higher altitudes Possible desynchronisation between the change in plumage (white) and the snow season?	Fewer periods of snow cover, earlier spring	Positive effect: improved climatic conditions during chick rearing Negative effect: adults are more vulnerable in winter (less effective camouflage) and increased disturbance during the chick-rearing rearing period	Potential increase in mountain use in spring leading to an increased level of disturbance during the chick-rearing periods	- Limit use of known breeding and wintering areas - Raise awareness among mountain users - Maintain ptarmigan areas (moorland, bilberry bushes) to prevent them from closing - Monitor populations to develop knowledge
	Justification and source(s)		Interview with warden and local ornithologist Bibliography	Climate analysis of the protected area	Interview with warden and local ornithologist Bibliography	Interview with warden and local ornithologist	Interview with warden and local ornithologist
	Level of confidence		Average: Need for longer-term monitoring of changes in the bird's plumage.	Good	Average Need for longer-term monitoring of the effects of early spring on nesting success.	Average climate variability and its effects to be monitored	Good Adaptation options are already valid for the species currently

Hypothetical example of detailed analysis (vulnerability) of a « natural heritage » object

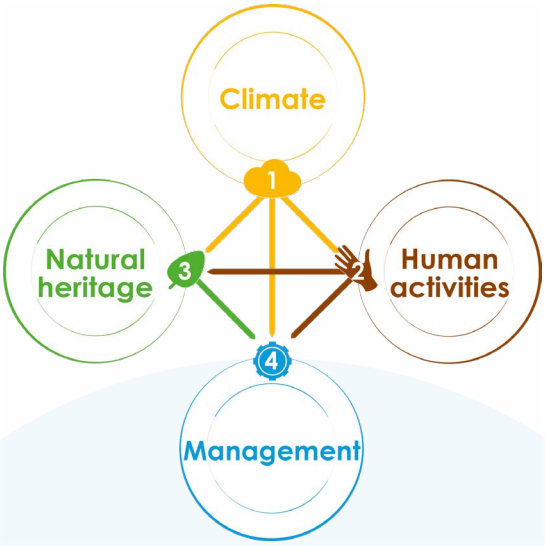
3 Object of analysis		Observed effects	Vulnerability / opportunity in the face of climate change							Adaptation options
Information	1. **Why** did you choose this object?	2. What are its **main characteristics** within the chosen analysis perimeter?	3. What **effects** of climate change have **already been observed** on the object?	4. Main **parameters and climate hazards** influencing the object *To be included in climate analysis*	5. **Sensitivity** of the object to these parameter	6. **Anticipated evolution** of these parameters (exposure)? *See climate analysis*	7. **Ways of adapting** the object (itself)	8. **External factors** (human activities, physical barriers, etc.) influencing adaptability	9. How will **these factors evolve** with climate change? *See analysis of human activities .*	10. Overall **adaptability of the object** (7X9)	11. How **vulnerable** is the object (5X6X10) ? *Result to be integrated into the analysis of human activities and management components*	12. How can the management of this object be adapted? *Result to be integrated into the 'adapting management' phase*
Forestry	Threatened species, symbolic of the protected area, conservation issue in the management plan	Mountain bird, nesting on the ground, in the open, relies on the camouflage provided by its plumage ('earth' colour in summer, white in winter)	Birds ascending to higher altitudes Possible desynchronisation between the change in plumage (white) and the snow season?	Snow cover (period), spring precipitation	Very sensitive to snowfall Very sensitive to spring precipitation	Further reduction in snow cover, uncertainty over spring precipitation trends	Find out more about plumage colour change?	Winter and spring visitor numbers	Winter and spring visitor numbers increasing depending on the year	Average to low	Very	- Further restrict use of known breeding and wintering areas - Raise awareness among mountain users - Maintain ptarmigan areas (moorland, bilberry bushes) to prevent them from closing in - Monitor populations to develop knowledge
Justification and Source(s)			Interview with warden and local ornithologist Bibliography	Local weather station close to protected area	Bibliography, expert opinion and monitoring	Climate analysis of the protected area	Bibliography, expert opinion	Bibliography, monitoring carried out in the protected area and expert opinion	Workshops with local stakeholders	Low	Bibliography, expert opinion	Interview with warden and local ornithologist
Level of confidence			Average Need for longer-term monitoring of plumage	Good Data sets on precipitation, temperature, snow duration in excess of 30 years	Average Lack of observations on the species' response to shorter snow cover	Good Use of DRIAS and consideration of uncertainties in the projections	Low A field that still needs to be studied	Good The pressures on the species are well known and climate change will exacerbate them	Average Major uncertainties remain, linked to annual variations in climate climate	Low Knowledge gaps and uncertainties	Average Lack of knowledge and uncertainties, but species restricted to mountain environments, which are themselves vulnerable	Good Adaptation options are already valid for the species currently

« Management actions and resources » component

Objectives

The component involves analysing:

- **The** direct and indirect **effects** (simple analysis) of climate change on the protected area's management actions and resources, or their vulnerability (detailed analysis)
- **Current management** in relation to the expected changes caused by climate change.



4 What are and will be the effects of climate change and changes in human activity on the protected area's **management actions and resources** (in the absence of adaptation)?

How are **current management** actions and resources **appropriate** in the context of climate change?

What are the **first ways of adapting**?

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Why analyse the effects of climate change on management actions and resources?

The management actions and resources of your protected area are and will be affected negatively or positively by climate change. Effects can be:

Direct

For example, management by grazing or mowing, hydraulic infrastructures, reception buildings, premises, etc. may be subject to the impacts of climate change (risk of flooding on the coast, impossibility of grazing because of a heatwave, easier mowing in wetlands because of drought, etc.). The same applies to working conditions (monitoring on the ground, events with schoolchildren, public visits, etc.) and the regulations.

Indirect

through changes in the other two components

The expected changes in human activities may reinforce or attenuate the effects of climate change on your actions and management methods. The same applies to changes in our natural heritage. For example, the extinction of an iconic species may render obsolete awareness-raising initiatives based on that species. It is therefore necessary to take these effects into account.

How do you go about it for management actions and resources?

1. REFINE THE LIST of objects to be analysed (species, habitats, functions, etc.), particularly with regard to the results of the climate analysis and the analysis of human activities);

2. COLLECT INFORMATION on the selected human activities and their **past and future** evolution under the effect of climate change using the **bibliography** (management documents, sectoral studies, etc.) and by **mobilising stakeholders** (surveys, interviews, workshops, etc.).

3. ANALYSE THIS INFORMATION OBJECT BY OBJECT (analysis of vulnerability or potential effects), then **cross-analyse** (to take account of possible interactions between objects), if possible **collectively** (with experts, colleagues, etc.) **and imagine** how human activities might evolve in the context of climate change.

NB: Remember to specify the sources of information and the levels of uncertainty.

- Suggested sheets of standard questions to ask yourself are provided for the two levels of analysis: ***factsheets 5 and 6***
- Two hypothetical examples of analysis are given on the following pages.
- The analysis may lead to a review of the list of objects in the other three components.

4. SHARE AND CONSOLIDATE the results of the analyses with those involved and **validate** them with the governing bodies of the protected area (depending on the choices made during the planning phase).

Why analyse current management in the light of expected climate change?

You need to analyse your current management using your 'climate change glasses' to plan how to adapt. This analysis will enable you to **take a step back** from what you have been doing, sometimes for several years, and to start preparing for climate change.

This analysis concerns both the **management objectives and the measures set out in your document management actions and resources implemented.**

For example, in terms of objectives, will the habitats and species for which the protected area has special responsibility in the past still be the same in the future? Are the objectives set still relevant in the light of climate change? Should the aim always be to maintain a particular type of habitat or species which will more or less be lost or extinct in the long term (according to the previous analysis), or is it better to support the transition, by working on the concept of ecological corridors to other protected areas, for example?

Similarly, some management measures are probably already contributing to adaptation, although this was not initially their objective (for example, the restoration of ecological corridors or degraded environments). And others may need to be revised.

This analysis will **prepare and feed into the discussions for drawing up the adaptation plan.**

Sometimes climate change can call into question the management that has been in place for several years, or even the very foundations of the protected area and the way it is managed. This can be unsettling, so take the time to digest and share it. The adapting management phase will enable you to bounce back!

How do you analyse current management?

This involves scrutinising the objectives, actions and resources currently implemented for the natural heritage in your protected area, bearing in mind climate change and its impacts. This can be done in a very simple way, for example:

- By listing the current management objectives, actions and resources
- By asking the following questions for each objective:
  - Is this still **relevant** in the short, medium and long term, given climate change and its impact on the protected area's natural heritage?
  - What needs to be **changed**?
  - In what way do they or do they not **contribute** to adaptation to climate change?
- Based on the responses, **categorise what needs: to be continued / to be modified and how / to be abandoned / to be created.**

Some protected areas have opted for this process to initiate an adaptation process, without going through a prospective analysis. **This method has the advantage of being quick, but does not provide a dynamic representation of the protected area and its components.** There is therefore a risk of stopping at an analysis of current management practices, without taking into account the way in which the socio-ecosystem as a whole will evolve under the impact of climate change. This is why we are proposing it here as a complement to the analysis of vulnerability/potential effects on your objects.

HYPOTHETICAL EXAMPLE OF SIMPLE ANALYSIS (POTENTIAL EFFECTS) OF A « MANAGEMENT ACTIONS AND RESOURCES » OBJECT

4	OBJECT OF ANALYSIS		OBSERVED EFFECTS	POTENTIAL EFFECTS OF CLIMATE CHANGE		POTENTIAL ADAPTATIONS	
OBJECT	1. **Why** did you choose this object?	2. What are its **main characteristics** within the chosen analysis perimeter?	3. What **effects** of climate change have **already been observed** on the object?	4. How will the main **parameters and climate hazards** influencing the object evolve? *See climate analysis*	5. What are the **potential effects** of this future climate on the object?	6. What are the main **external** (non-climatic) **factors** that could limit or promote the adaptation of the object and how will they change? *See analysis of human activities + any other factors*	7. How can this action/management tool be **adapted**? *Result to be integrated into the 'adapting management' phase*
PROGRAMME OF EVENTS	Communication and awareness-raising tools	**2 themes:** discovering the protected area, biodiversity Format: visits, workshops **Target audience:** families **HR/logistics:** equipment, 1 FTE, daytime, by prior arrangement	**Themes:** questions from the public on climate aspects **Format:** impact of climate variations (heatwaves, droughts, storms, etc.) -> cancellation of activities **Target audience:** fewer 'fragile' people **HR/logistics/ report:** fewer people aware of the protected area-> reduction in the indicator linked to subsidy	More heat waves More extreme events (storms, heavy rain, etc.)	**Negative effect:** Change in visitor numbers (shift to other seasons) Damage to infrastructure used for events (e.g. tracks damaged by bikes after heavy rain)	Shift of visitors to air-conditioned activities (e.g. museum) Reluctance of wildlife team to offer night visits (disturbance to wildlife) Changes in the training for the events industry Potential changes to employment law regulations	Offer of partnership with other bodies – relays Co-construction of the programme of activities with the team and the scientific advisory board: modification to re-include vulnerable groups (postponement of outings: duration, period, indoors, etc.) Re-evaluated training plan to integrate climate change into the themes Regulatory monitoring, HR policy of the organisation. Discussions with joint bodies on potential changes to working hours.
	JUSTIFICATION AND SOURCE(S)		Planning document	Climate analysis of the protected area	Leader, protected area team	Shared workshop with protected area team, board of directors, funders, joint body	Shared workshop with protected area team, board of directors, funders, joint body
	LEVEL OF CONFIDENCE		Very high	Good	Good	Good	Good

4 OBJECT OF ANALYSIS		OBSERVED EFFECTS	VULNERABILITY / OPPORTUNITY IN THE FACE OF CLIMATE CHANGE								ADAPTATION OPTIONS
INFORMATION	1. **Why** did you choose this object?	2. What are its **main characteristics** within the chosen analysis perimeter?	3. What **effects** of climate change have **already been observed** on the object?	4. Main **parameters and climate hazards** influencing the object	5. **Sensitivity** of the object to these parameters	6. **Anticipated evolution** of these parameters (exposure) *À intégrer dans l'analyse climatique*	7. **Ways of adapting** the object	8. **(External factors** (human activities, physical barriers, etc.) influencing adaptability	9. How will **these factors evolve** with climate change? *Cf. analyse des activités humaines*	10.**Overall adaptability** of the object (7X9)	11. How **vulnerable is the object** (5X6X10)? *Résultat à intégrer dans l'analyse des autres composantes*	12. **How can this object be adapted?** *résultat à intégrer dans la phase "adaptation de la gestion"*
PROGRAMME OF EVENTS	Communication and awareness-raising tools	**2 themes:** discovering the protected area, biodiversity **Format**: visits, workshops Target **audience:** families **HR/logistics:** equipment, 1 FTE, daytime, by prior arrangement	**Themes:** questions from the public on climate aspects **Format:** impact of climate variations (heatwaves, droughts, storms, etc.) -> cancellation of activities Target **audience**: fewer 'fragile' people **HR/logistics/ report:** fewer people aware of the protected area-> reduction in the indicator linked to subsidy	Heat waves Extreme events (storms, heavy rain, etc.)	Very sensitive to heat waves Very sensitive to extreme events (storms, heavy rain, etc)	Multiplication des vagues de chaleur : défavorable Multiplication d'évènements extrêmes (orages, fortes pluies…) : défavorable	Means: strong proposals of the team within the limits of employment law, the sensitivity of the environment and public support	Shift of visitors to air-conditioned activities (e.g. museum) Reluctance of wildlife team to offer night visits due to the nature of the protected area) Changes in the training for the events industry Potential changes to employment law regulations	Unfavourable Unknown Favourable Unknown	Average	Very	Offer of partnership with other bodies – relays Co-construction of the programme of activities with the team and the scientific advisory board: modification to re-include vulnerable groups (postponement of outings: duration, period, indoors, etc.) Re-evaluated training plan to integrate climate change into the themes Regulatory monitoring, HR policy of the organisation. Discussions with joint bodies on potential changes to working hours
JUSTIFICATION AND SOURCE(S)			Planning document	Climate analysis	Expertise of team	Climate analysis	Expertise of team	Shared workshop with protected area team, board of directors, funders, joint bod	Expertise of team	Expertise of team	Matrix in *factsheet 6*	Shared workshop with protected area team, board of directors, funders, joint body
LEVEL OF CONFIDENCE			Very good	Good	Good	Good	Average	Good	Average	Low	Low	Good

PREPARING THE VULNERABILITY AND OPPORTUNITIES ASSESSMENT AND THE PROSPECTIVE REPORT ON THE PROTECTED AREA

Objectives

Compile and summarise the results of the previous stages by drafting a vulnerability and opportunities assessment for the protected area.

Why prepare an assessment?

Compiling and summarising the results of the previous stages in the form of a vulnerability and opportunities assessment enables you to:

- **Document and keep track** of your thoughts and analyses (all the analysis tables, results, etc.) regarding the evolution of the components of your protected area under the impact of climate change
- **Provide a reference document** that you can use in the course of your work, for example when renewing your management document, drafting an opinion as part of an environmental authorisation application procedure, drafting a Natura 2000 impact assessment or integrating your assessment into other adaptation strategies in the area
- **Have a document that** you can easily update as available knowledge changes
- **Share** the results, both internally and externally, with those involved and those to be involved in the next phase! Sharing the results of the assessment is essential to prepare your teams and partners for your adaptation strategy.

Why prepare a prospective report?

The prospective report we are proposing is a **narrative document** based on the results of the analyses of the four components of the protected area. It enables these results to be **put into perspective**, according to **one or more trajectories** (future scenarios for the protected area), to ensure that they are consistent and to share them more widely.

Writing this prospective report makes it possible to:

- Go beyond object-by-object analysis to build a **vision of the future of the protected area as a whole**
- **Put** this future **into words** and tell its story, so that we can better plan for the future
- Produce a document that is easier to **share** and more inspiring than the vulnerability assessment, particularly with local stakeholders
- **Conclude** the vulnerability and opportunities assessment **and draw up one** or more basic scenarios for drawing up the adaptation plan.

How do you go about it?

1. Draw up the vulnerability and opportunities assessment

The vulnerability and opportunities assessment brings together, **summarises and records** the results of the previous stages in a single document that can be **shared and developed.** You can draw it up:

During your analyses

+	−
Everything or almost everything is recorded and not much time is needed to write up at the end of the phase.	The iterative nature of the process means that you may have to repeat parts regularly.

Or at the end of the phase

+	−
You'll be more concise and won't have to go back over the writing process time and time again.	At the end of the phase, you will need to spend a considerable amount of time writing and you may forget elements that could be useful for understanding the process and its results.

The recommended content for the vulnerability and opportunities assessment is available in factsheet 7.

Find examples of vulnerability and opportunities assessments here (English summries).

2. Draw up the prospective report

You can structure your prospective report in several ways.

However, we recommend that you base it on a timeline with several time intervals: short term: 2025 / medium term: 2030; long term: 2050; to make it easier to construct your adaptation plan.

You can also consider:

- **Several** scenarios for changes in human activities
- Several scenarios for **changes** in the effects of climate change
- Other scenarios.

Your report can take a variety of forms: a narrative history of the site; the evolution and future of the site as told by the site itself; an illustrated story; a comic strip; maps, etc. anything is possible! It's up to you to choose **the format that seems most appropriate for you and your target audience.** (Who do you want to tell it to?)

Note that it is possible to run f**uture-oriented workshops to co-construct this report** (with the general public, schoolchildren, local stakeholders, colleagues, etc.). It is also possible to include the organisation of this type of workshop in your future adaptation plan, as an action to raise awareness and involve people!


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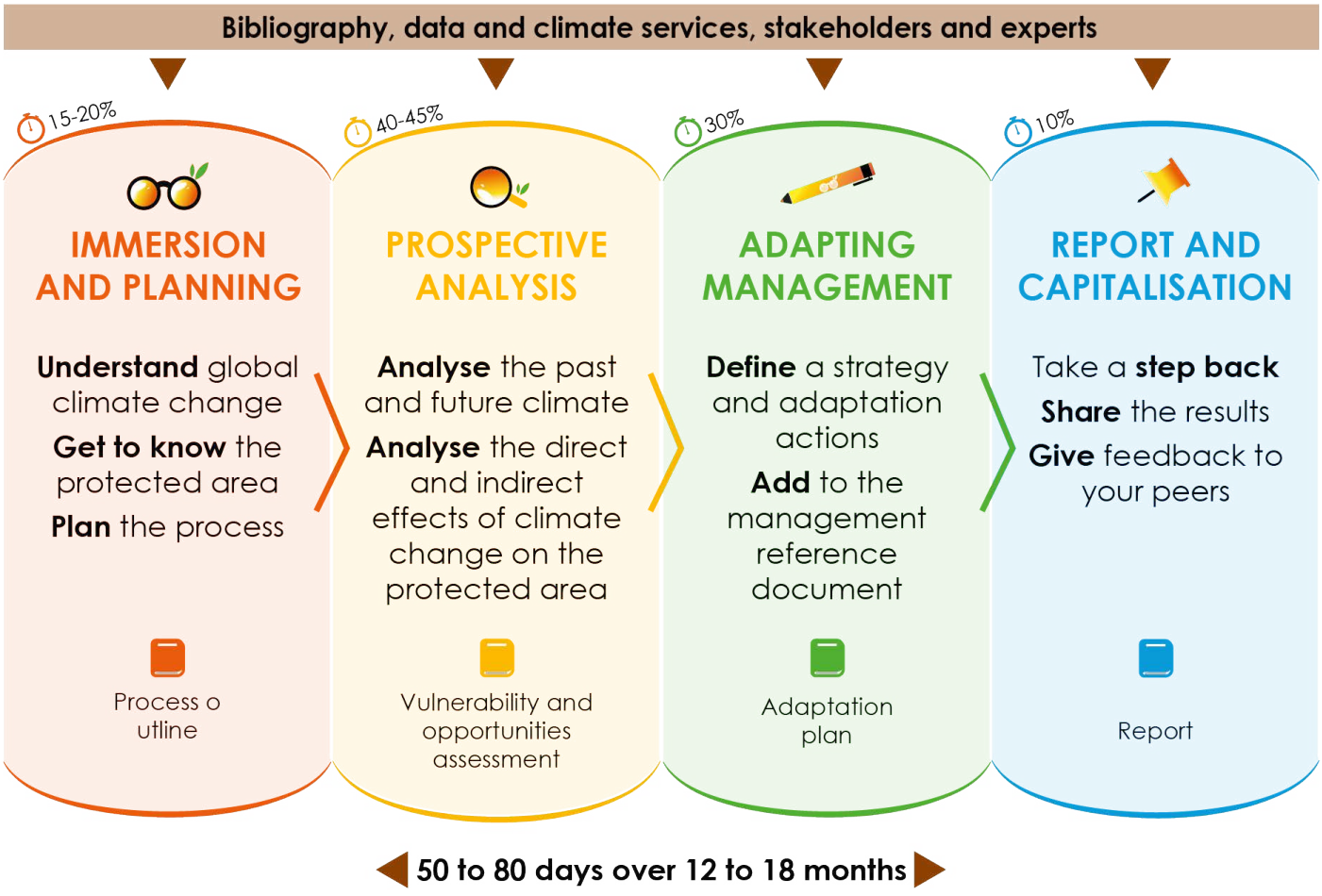
Adapting management

Natur'Adapt methodological guide to adapting to climate change


Bibliography, data and climate services, stakeholders and experts
15-20%
IMMERSION AND PLANNING
Understand global climate change
Get to know the protected area
Plan the process
Process o utline
40-45%
PROSPECTIVE ANALYSIS
Analyse the past and future climate
Analyse the direct and indirect effects of climate change on the protected area
Vulnerability and opportunities assessment
30%
ADAPTING MANAGEMENT
Define a strategy and adaptation actions
Add to the management reference document
Adaptation plan
10%
REPORT AND CAPITALISATION
Take a step back
Share the results
Give feedback to your peers
Report
50 to 80 days over 12 to 18 months

Phase objectives

After assessing the protected area's vulnerability to climate change, this third phase aims to **plan action in response to the results of the prospective analysis:** this is the adapting management phase.

As a reminder, the aim of adapting climate change is **to anticipate and reduce the consequences** of climate change on natural systems and society. It is a **process of adjusting** to the current or expected climate and its consequences, so as to mitigate the harmful effects and exploit the beneficial effects.

We know that we have to anticipate change if we want to preserve the functions performed by the reserve.

The fact is that management and management methods are also affected by climate change. The adaptation plan offers a 'glimmer of hope,' a chance to do something about the changes to come.

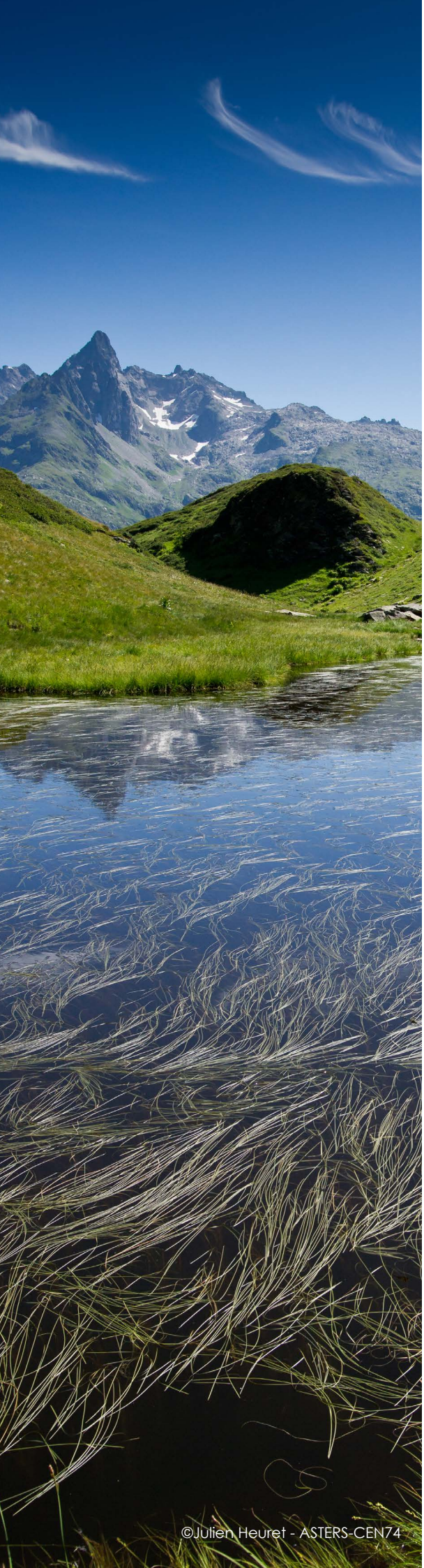
Here we are concerned with **adapting the management of the protected area**, i.e. adapting the objectives, actions, practices, operations, measures, tools and resources mobilised to preserve the natural heritage of the protected area (studies, monitoring, surveillance, works, maintenance, regulations, agreements, governance, awareness-raising, education, events, etc.).

This specifically involves:

Preparing an adaptation plan for the protected area, consisting of an adaptation strategy (stage 1) and associated adaptation measures (stage 2)

Defining the monitoring and evaluation of this adaptation plan, with a view to 'adaptive management' (stage 3)

Preparing to incorporate the results of your process into your management **reference document** (stage 4)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Step 1: Drawing up the adaptation process

Why?

The adaptation strategy is the **first stage of the adaptation plan.** Based on the results of the vulnerability assessment and the prospective report, it sets out the long-term course of action (aims, spirit, ambitions) and the collective project (collectively desired future) for the management of the protected area. It determines how you will position yourself to reduce the impact and/or vulnerability of your protected area. It can then be used to guide the definition of adaptation measures.

How do you go about it?

The adaptation strategy is defined on the basis of the **results of the prospective analysis.** The question is: «Given the results of the vulnerability and opportunities assessment and the prospective report, what do we want and can we achieve in the short, medium and long-term? What is our goal for the protected area?»

Your choice of strategy depends on your context, **the room for manoeuvre available** within the protected area in terms of resources, and the **possibilities for action for the vulnerabilities** studied. (Is it a foregone conclusion or not?)

It can **be differentiated** according to the vulnerabilities, environments, species or geographical zones of your protected area, or even the time frame. For example, it is possible to leave things alone in some areas and support others, or to resist temporarily before supporting others.

It is important to **define this strategy collectively** and to validate it with your governing bodies, as it will form the basis of your adaptation actions!

In terms of format, the adaptation strategy does **not have to be a long text.** One paragraph is enough to describe what you want to achieve by adapting management to climate change.

Resist, Accept or Direct?

Different strategies are possible in the face of climate change. To help you understand them, we offer the framework recently developed to help US National Park managers choose their climate change adaptation strategy[14]. It is based on three areas of adaptation:

Resisting, mean 'fighting' to maintain what already exists, or even to return to the conditions of the past (species, environments, functionalities) by acting against change and development.

Accepting, means admitting that change is under way and 'letting nature take its course,' allowing it to adapt autonomously.

Directing, means accompanying change towards a future that is more desirable than if we did nothing.

This 'resist-accept-direct' framework can be illustrated by an allegory about sailing:

"The boat Resist fights against the wind in an attempt to return to its starting point. The wind and waves push the Accept boat towards unknown places. The captain of the boat Direct uses the conditions to head for a new location of his choice."

	Example strategy and resultant objectives		
Strategy	You choose not to accept = **Resist**	You choose to support = **Direct**	You choose to accept and let nature take its course = **Accept**
Example Operational objectives	**Slow** down the trajectory **Conserve** (a given species/ habitat) **Monitor** the results of actions and trends	**Reverse** the trajectory **Ac-celerate** the transition **Re-focus** the issues **In-crease** the resilience of environments	**Let things happen naturally / implement free development** Acquire **knowledge** **Document** changes
Example Actions	Monitor the effects of cli-mate change Moni-tor the effects of actions Act to keep environments in their current state	Limit/stop anthropogenic pressures (excluding climate change) Increase connectivity Encourage environmental mosaics	Free evolution: let ecosystems evolve Observe change Prepare for change

An adaptation strategy can combine the three elements and evolve over time, e.g. allowing certain environments to evolve freely (accepting), setting up ecological corridors to encourage the movement of certain species (directing) and conserving an endemic species 'at all costs' (but temporarily) (resisting).

It can therefore include several adaptation trajectories, with diverging 'thresholds' between these trajectories, depending on climatic changes, changes in the natural heritage or changes in human activities.

[14] *National Parks Service, 2021. Resist-Accept-Direct (RAD) - A Framework for the 21st-century Natural Resource Manager.*

Step 2: Defining the adaptation measures

What is an adaptation measure?

Adaptation measures aim to respond to the adaptation strategy and to act on the potential effects and vulnerabilities identified within the protected area.

The aim is generally to limit **the negative effects of climate change and take advantage of any positive effects on the protected area, which often involves reducing anthropogenic pressures and improving the functioning and resilience of the environment.**

Adaptation measures can include:

- **Management of the protected area's natural heritage, whether proactive** (e.g. restoring environments, modifying grazing systems, etc.) or not (free evolution);
- **Management tools:** protected area perimeter, regulations, land acquisition, contractual measures, management reference document, salaried team, volunteers, premises, equipment, etc.
- **Improving knowledge** (studies, monitoring, installation of equipment, weather stations, etc.), particularly in relation to the gaps identified during the prospective analysis
- **Communication** (videos, factsheets, etc.) and raising public awareness (events, exhibitions, etc.) of climate change and its effects, including among socio-professional players, to encourage them to adapt their practices to take account of the effects on the protected area
- **Governance** of the protected area (including a climatologist on the scientific board, creation of a working group dedicated to the process, etc.)
- **Monitoring and evaluation** of the adaptation process, to ensure that it remains a learning and adaptive process. (See step 3.)

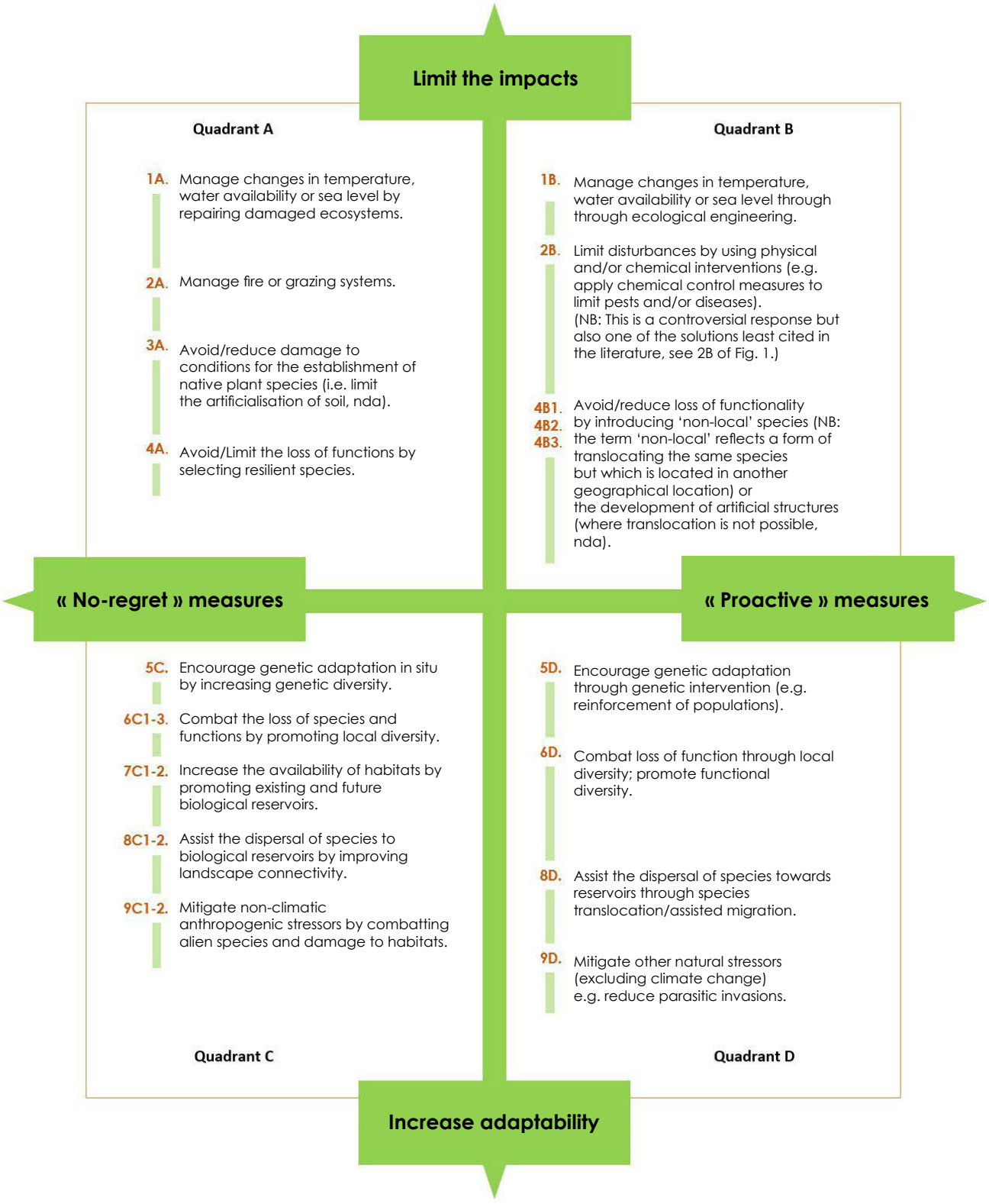
They may concern **the protected area as a whole or certain sectors, but also its interdependence zone** and/or more specifically **certain aspects of the natural heritage.** They may **be new measures** or, often, **measures that already exist in your management document,** but which have been modified and adapted **to take account of climate change.**

Examples of adaptation measures are available in factsheet 8

Adaptation measures are not necessarily « innovative, » revolutionary or new. They are often existing or known management actions and measures, but their aim becomes to enable adaptation. This has to be accepted and taken on board, even if it's not always easy to justify externally. (There are often a lot of expectations.) The innovation lies in the adaptation process itself and in your 'climate change glasses,' which enable you to think about your management in terms of this new situation.

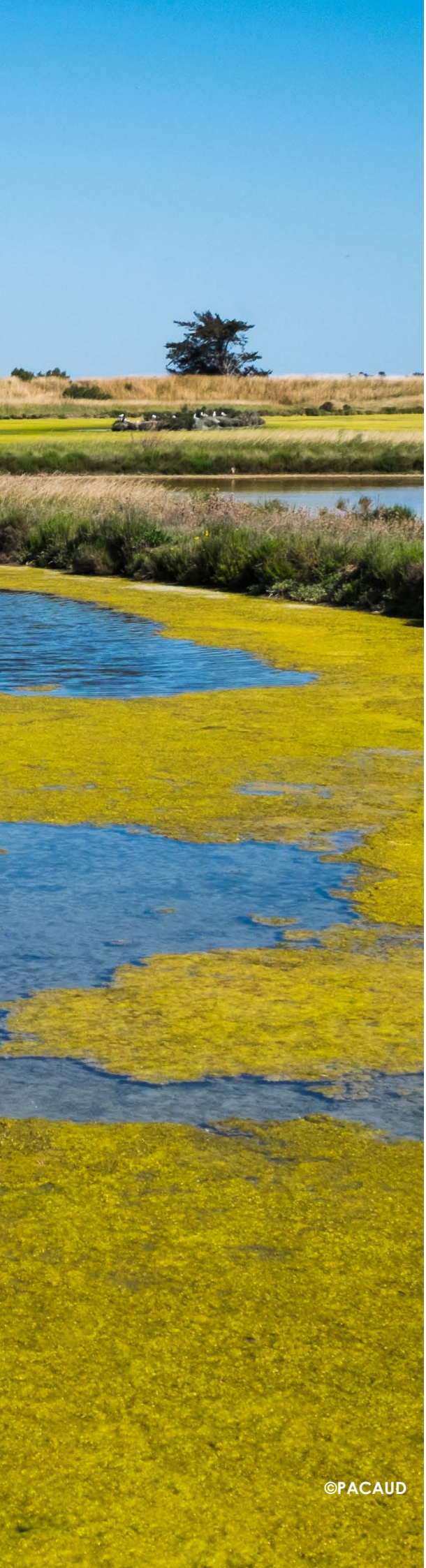
Two international studies have summarised the adaptation measures proposed in the scientific literature. They identified 23 types of adaptation measures classified according to two criteria: their objective ('to limit impacts' or 'to improve adaptability') and the level of interventionism ('no-regret' versus 'proactive' measures)[15].

Here is the summary:



Classification of 23 measures to strengthen the resilience and adaptability of biodiversity in the face of climate change, adapted from Heller & Zavaleta (2009) and Prober et al. (2019).

[15] *UMS Patrinat, 2020. Synthèse des mesures possibles pour favoriser l'adaptation de la biodiversité au changement climatique basée sur Prober et al. (2019) et Heller & Zavaleta (2009).*



How do you go about it?

1. Choose the adaptation measures

In practical terms, when it comes to choosing adaptation measures, you'll have to start from:

- **Your adaptation strategy** (measures = operational implementation).
- **The results of the prospective analysis phase,** during which you identified the potential effects and/or vulnerabilities of your 'objects of analysis' and considered ways of adapting the 'natural heritage' and 'management tools and resources' components (measures = responses to the effects/vulnerabilities).
- **Your management document,** with some planned measures needing to be updated to take account of climate change in your protected area (see the analysis of current management carried out during the prospective phase) (measures = revised existing operations).

From the list of measures thus obtained, **a choice** will have to be made, **based on criteria** (to be defined collectively, in conjunction with your governance bodies) such as their relevance, technical feasibility, cost, social acceptability, etc. as well as a **prioritisation**, according to the time frame for their implementation.

When defining and selecting adaptation measures, remember to involve not only your team but also, depending on your context, local stakeholders, through workshops or dialogue meetings. In fact, as you will see, some adaptation measures go beyond the protected area, and the implementation of some of them depends on local stakeholders. It is therefore useful to share this stage of your process.

You will undoubtedly need to draw up **an initial list** of measures, which will be supplemented and amended by other measures, in light of your adaptation strategy but also during your meetings and discussions with your teams and local stakeholders. Defining the adaptation plan is **also an iterative process!**

Some recommendations to help you choose your adaptation measures

Adaptation actions and measures must give priority to **preserving and improving the functionality of 'natural' environments**, the preservation of natural heritage being the raison d'être of protected areas. The climate emergency must not lead to adaptation solutions that take precedence over nature conservation. Protecting nature is also a way of adapting to climate change.

They must **avoid poor adaptation**, i.e. not reinforcing climate change by, for example, emitting more greenhouse gases (GHGs) into the atmosphere, whatever the time frame.

They should be **chosen pragmatically. 'No-regret'** measures, which remain relevant regardless of future climate trends, are preferable. Anticipate **any disadvantages or obstacles** to their implementation. (For example, some measures are more costly than others or less acceptable to local stakeholders, etc.).

Preference should be given to actions with **co-benefits:** measures that can respond to the vulnerability of several 'objects of analysis' (species, functionalities, etc.), measures that serve both to adapt to and mitigate climate change, measures that serve several natural heritage issues, measures that have a positive impact on other stakeholders, other objectives, other areas, etc.

Remember to define **the time frame for their implementation**: some measures can be planned for the short term, others for the medium or long term, and some measures will only be implemented under certain conditions (for example, after a serious disturbance).

Reducing the extent of climate change (mitigation) must also be a concern, and even a duty, of the protected area. Mitigation-related actions may be considered as part of, or complementary to, the adaptation plan.

How do you go about it?

2. Describe and document the adaptation measures in the adaptation plan

There are several ways of recording your adaptation measures in your adaptation plan. It's up to you to create the description that suits you best. Here are a few ideas to help you:

You can find examples of adaptation plans here (summaries in English)

- **Start from your 'objects of analysis' or your components,** and for each of them, list: the potential effects/vulnerabilities; the current management (as described in the management document); the objectives and ways of adapting; the adaptation measure(s) selected; their summary description, then referring to a detailed operational action sheet (which will describe the operations to be carried out, their timetable, their cost, etc.).

Object of analysis (or component)	Potential effect / vulnerablity (from assessment)	Current management (if relevant)	Adaptation objective (and link with adaptation strategy)	Measure	Description of measure
Subalpine stage	Extinction/loss in the medium term	Maintenance of the subalpine stage by combatting human pressures	Accept extinction/loss, Monitor the evolution of the environment, strengthen the resilience of the protected area (overall)	Monitoring the evolution of the subalpine stage in the face of climate change	Implementation of a centre for monitoring climate change and its effects on natural environments (level of protected area + region)
				Restoration /mainte-nance of the mo-saic of envi-ronments at the level of the protec-ted area	Implementation of mapping the mosaic (zones to maintain; free evolution zones)

Hypothetical example of a measurement table based on objects of analysis or components

- **Start from the potential effects/vulnerabilities and group into measures** (when a measure addresses several vulnerabilities) and then break down these measures by object/component/ vulnerability.

Title of measure	Object/Component concerned by the measure	Impact / vulnerability addressed by the measure	Objective of the meas-ure	Details of the measure
Measure 1: Monitoring climate change and its impact on natural heritage	Natural her-itage com-ponent – subalpine level	Extinction/loss in the medium term	Document changes in the subalpine zone and the mosaic of environments	*Implementation of a centre for monitoring climate change and its effects on natural environments (level of protected area + region*
Measure 2: Restoration of the mosa-ic of envi-ronments	Natural heritage component – subalpine level	Extinction/loss in the medi-um term	Continue current man-agement until it ceases to exist	*Late mowing (agreement with farmers)*
	Natural herit-age compo-nent – Soft-wood forests	Extinction/loss in the long term	Removal of ageing soft-wood stands	*Cutting age-ing stands*
	...	...	...	...

Hypothetical example of a measurement table based on objects of analysis or components

- **Start from your adaptation strategy, if this is broken down into objectives,** or from the major issues identified (e.g. adaptation plans for the Réserve naturelle régionale des tourbières du Morvan or Réserve naturelle nationale de Chastreix-Sancy).
- **Organise your adaptation measures according to management trajectories (threshold effects, if... then...) and/or time frames (short, medium, long term)** used, for example, in the prospective narrative (e.g. adaptation plans for the Réserve naturelle nationale de Lilleau des Niges or the Réserve naturelle nationale de la Petite Camargue Alsacienne).
- **Find any other structure you think is relevant!**

Whatever you decide to do, remember to establish a clear link with:

- The results of the prospective analysis
- Your adaptation strategy
- Current management, in particular with your management document.

In particular, we advise you to **describe your adaptation measures in the same way as your management measures:** this will make it easier to integrate the adaptation measures into your management document when it is revised.

Step 3: Defining the monitoring and evaluation of the adaptation plan

Why?

Monitoring and evaluating the adaptation plan is an essential stage in your adaptation process. The objectives are to:

- **Monitor the implementation** of the adaptation plan, i.e. monitor the measures listed, their implementation and management, and report on their level of execution

- **Ensure the adaptation dimension of management** by measuring the results of the adaptation measures and monitoring climate change and its impacts, both of which will enable you to assess whether the adaptation strategy and measures chosen are still relevant or whether they need to be revised.

« Adaptative » management

A-Z

Adaptive management is management that adapts to developments and changes in the protected area. This involves the possibility of adjusting the measures in your adaptation plan if, following a change, they prevent the set objectives from being achieved, but also of reviewing **the management objectives** if they are no longer relevant in the light of the changes observed.

How do you go about it?

Monitoring and evaluating the adaptation plan involves:

- Defining and monitoring **indicators for implementing the adaptation plan,** in order to track the implementation of the planned measures and justify any deviations. These indicators answer the question:
"Have we or have we not carried out the action in the adaptation plan?"

- Define and monitor **indicators of the effectiveness of adaptation measures,** to ensure that the measures are achieving the objectives set. These indicators answer the question: «Have we achieved the ambition we set ourselves?» and more specifically: «Have we reduced such and such an effect of climate change?» or «Have we increased the adaptability / reduced the vulnerability of such and such an object to the effects of climate change?»

- **Set up a system for monitoring changes in climatic conditions and their effects** on habitats, species and functionalities, so that you can assess whether the objectives set are still relevant or whether they need to be adapted in the light of the changes observed. Monitoring changes in climate conditions in your protected area and their effects can be one of the measures in your adaptation plan.

How often should monitoring and evaluation be carried out?

The adaptation plan should be implemented over several years. As with your management document, you can reassess the adaptation measures each year and adjust them if necessary.

Then, at intervals of around two to three years, your monitoring and evaluation should include a more in-depth assessment of your adaptation plan, so that you can readjust the measures or even the objectives set if they are not feasible or no longer relevant, given changes in climatic conditions or new knowledge available.

Step 4: Preparing for integration into the management document

Why?

Since the aim of the process is to integrate climate change into the management of your protected area, incorporating its results into your management document (management plan, charter, DOCOB (objectives document) or other) is an essential step.

How do you go about it?

As a reminder, the Natur'Adapt process is relevant at any point in the management cycle. So:

- If your document is in the process of being implemented, you will formally integrate the results later, when it is revised, but you can 'prepare' this future integration during the process, for example by drawing up a roadmap.

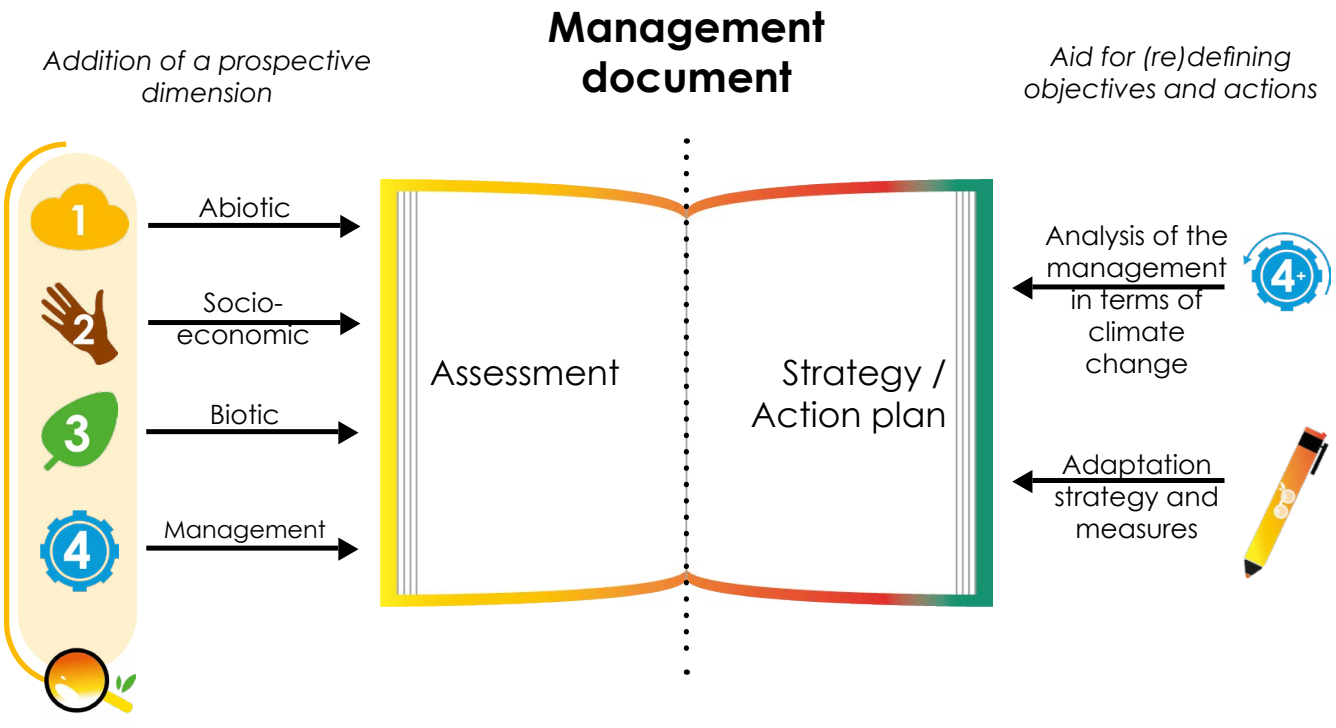
- If the process coincides with the revision of your management document, you can do it directly at this stage!

Eventually, each management document should be able to incorporate climate change into its own management cycle, without the need for parallel consideration: climate change will become a key management parameter in the same way as all the other parameters that managers already take into account when making their management choices. The French national guide to management documents, known as CT88, which is based on management cycle international standards, will eventually incorporate this new parameter directly into the process of drawing up and assessing the management document, thanks in particular to the work carried out as part of the LIFE Natur'Adapt project.

The different stages of the Natur'Adapt process will feed into and enrich each part of your management document. Overall:

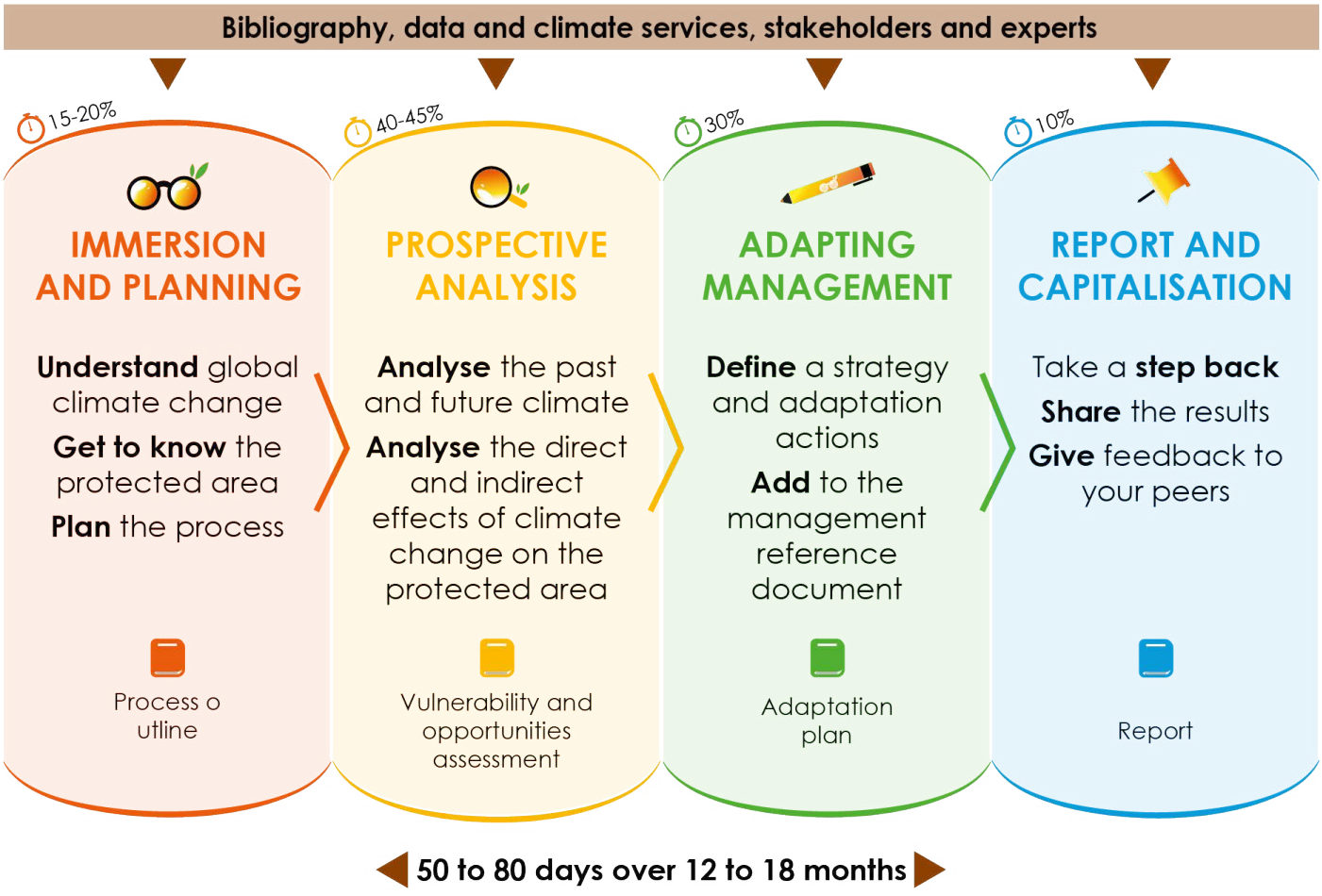
- **The vulnerability and opportunities assessment feeds into the assessment section** of your management document. In particular, it **adds a future-oriented dimension** and future projections to this section, which is often focused on the past and gives an account of the current state of affairs.
  - The results of the **climate analysis** can be incorporated into the abiotic part of the management document assessment (past, present and future climate).
  - The results of **the analysis of the vulnerabilities/potential effects** of climate change can be added to the biotic part of the management document assessment (**future** of the ecological, geological and landscape **objects** under the effect of climate change) for the 'natural heritage' component, to the socio-economic/pressure aspect (future of **uses**, activities, etc. under the effect of climate change) for the 'human activities' component and to the management aspect (**effects/vulnerabilities of current management**) for the 'management actions and resources' component. More generally, they shed new light on the responsibilities and challenges of the protected area, while **helping to prioritise** the elements on which management objectives and actions will focus.

- **The analysis of current management and the adaptation plan feed into the strategic/action plan section** of your management document. They help to (re)define the objectives (long-term, operational, etc.) and actions to be implemented. The guidelines/strategies/objectives identified when the adaptation plan was drawn up can be a useful initial basis for defining the future strategy and objectives of the next management document. The adaptation plan may also lead to actions being reinforced, modified, dropped or introduced.



Report and capitalisation

Natur'Adapt methodological guide to the climate change adaptation process


Bibliography, data and climate services, stakeholders and experts
15-20%
IMMERSION AND PLANNING
Understand global climate change
Get to know the protected area
Plan the process
Process o utline
40-45%
PROSPECTIVE ANALYSIS
Analyse the past and future climate
Analyse the direct and indirect effects of climate change on the protected area
Vulnerability and opportunities assessment
30%
ADAPTING MANAGEMENT
Define a strategy and adaptation actions
Add to the management reference document
Adaptation plan
10%
REPORT AND CAPITALISATION
Take a step back
Share the results
Give feedback to your peers
Report
50 to 80 days over 12 to 18 months

Phase objectives

Take a step back from the work accomplished and the progress made throughout the process

Share the results with the stakeholders and provide feedback to your peers

Why?

First of all for you, your team and the people you have involved in the process.

Adapting to climate change is a process, a disruptive journey. And this process is just as important as the results of the prospective analysis, because it is the process that enables you to put on your climate change glasses.

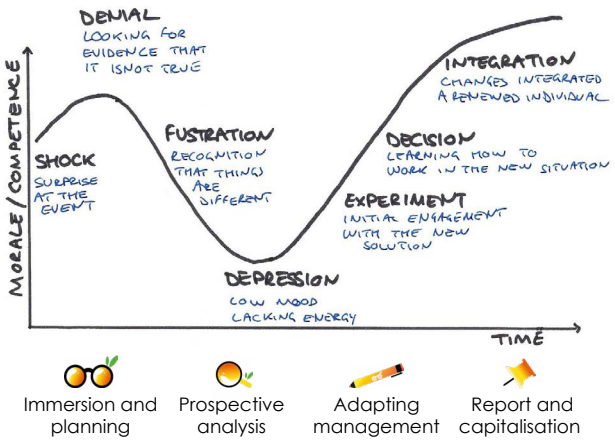
The process helps us to realise that species and environments within the protected area will be lost, while others will emerge and balances will be altered, sometimes profoundly. It calls into question current management, from objectives to operations, which is no small change.

In the course of the process, we must therefore expect to go through the various emotional phases of change, which are similar to those of mourning (Kübler-Ross model).

« There was a bit of a rough patch in terms of awareness of the effects of climate change on the protected area [...] what's good about the process is that we don't stop at the assessment; we look at what to do next. »

« Findings which can affect everyone in a personal and very different way. »

Illustration of the processes of change according to Kübler-Ross (@differentlywired. co.uk) and process phase



That's why it's essential, at the end of the process (but also during it), to take a moment to reflect on what you've done, what you've experienced, what's happened for you, for the protected area team and for the stakeholders involved. This capitalisation can also be used to raise awareness of the work carried out within the protected area and to report back to the stakeholders involved.

Then, other stakeholders!

As you will see, the process of adaptation is not a smooth one, and it can be difficult to get started. Feedback from your peers is often the helping hand that helps you get started, and overcome any doubts or difficulties you may have encountered. You benefit from the experience of 21 protected areas, so it's up to you to help others in your own way!

How do you go about it?

The aim is to **take stock and share** the things that are worth taking stock of. It's up to you to define it!

We advise you to look in particular at:

The key elements of your process in terms of results

What do you consider to be the most striking results of the vulnerability and opportunities assessment? Why?

What are the key elements of your adaptation plan? Why?

Successes and difficulties encountered

What went well? What are you proud of?

What were the main difficulties encountered and how were they overcome?

Mobilisation and involvement of stakeholders

Has the process changed who you work with and how you work with them?

Has the process changed the way local partners/ stakeholders view your protected area?

Your personal development

What surprised/impacted you? What has it changed for you? How has your vision of the protected area, your job and your tasks changed?

What emotions did you experience? How do you feel at the end of the process?

The future!

What follow-up action is planned?

What future developments are planned?

This capitalisation of experience can be achieved and promoted in different ways, using different formats, such as a short report on the surprising nature of the process in the form of texts, images, videos, etc.

You can distribute it internally to those involved and your colleagues managing other protected areas!

You can share your experience with other managers on the collaborative platform: *https://naturadapt.com*

Don't wait for this phase to share the results of your adaptation process with your colleagues and local stakeholders: do so throughout the process!

Glossary

A

Adaptability

The quality(ies) that enable(s) a socio-system or ecosystem to reduce the negative effects and/or take advantage of the positive effects of climate change.

Adaptation

Generally speaking, the purpose of adapting to climate change is to anticipate and reduce the consequences of climate change on natural systems and society. It is a process of adjusting to the current or expected climate and its consequences, so as to mitigate the harmful effects and harness the beneficial effects.

Adaptative management

Management that adapts to developments and changes in the protected area. This involves the possibility of adjusting the measures in your adaptation plan if, following a change, they prevent the set objectives from being achieved, and also of reviewing the management objectives if they are no longer relevant in the light of changes observed.

C

Climate

The probability of occurrence of various weather conditions for a given region over a long period of time. Climate normals are generally calculated over 30-year periods.

E

Exposure

The nature, degree and frequency of climatic variations (and their physical consequences) likely to affect human or natural systems.

External factors

The non-climatic factors external to the object of analysis that may influence its ability to adapt.

I

Interdependence zone

Covers a wider area than a protected area, with which it maintains close relations (positive or negative): the natural environments and activities present in an interdependence zone directly or indirectly influence the natural heritage, management and human activities of a protected area, and conversely, the natural environments and activities present in a protected area can influence an interdependence zone. The boundaries of an interdependence zone correspond to a geographical area whose definition takes these various interactions into account.

M

Management actions and resources

All the actions, practices, operations, measures, tools and resources mobilised to preserve the natural heritage of the protected area (studies, monitoring, surveillance, works, maintenance, regulations, agreements, governance, awareness-raising, education, events, etc.).

Management document or reference document for management

A strategic document that defines a long-term vision and short/medium-term operational programming for a protected area. This includes management plans, Natura 2000 objectives documents, park charters, local contracts for sensitive natural areas, etc..

Manager

The term 'manager' refers to the protected area management body (and its representatives), in the sense of managers of the project for this area, as set out in its management reference document (management plan, charter, objectives document).

Meteorology

The study of atmospheric phenomena to produce short-term forecasts. It provides answers to questions such as: "What will the weather be like tomorrow or this weekend?" Weather forecasts can be made on a timescale of a few days to two weeks.

Glossary

O

Object of analysis

The representative element of the component on which the prospective analysis will focus.

- For the 'climate' component: structural climate parameters and indicators for the protected area
- For the 'human activities' component: those which have the greatest influence on the natural heritage of the protected area and the way it is managed
- For the 'natural heritage' component: species, habitats and functions that are representative and/or symbolic of the protected area
- For the 'management actions and resources' component: those that are most important for preserving the natural heritage of the protected area.

Opportunity

The element through which a socio-system or ecosystem will respond positively to climate change.

P

Potential effect

The potential positive or negative impacts of climate change.

Process leader

The person who will lead/coordinate the climate change adaptation process in the protected area, whoever that may be: a conservationist Natura 2000 officer, a national park or regional nature park officer, etc.

Prospective (analysis)

This means imagining possible futures in order to inform present-day choices. It's an intellectual process, a time for reflection to look to the future in a reasoned and holistic way. It enables us to anticipate rather than suffer, and to guide our decisions towards a desirable future

Protected area

A clearly defined geographical area that is recognised, dedicated and managed, by any effective means, legal or otherwise, to ensure the long-term conservation of nature and the ecosystem services and cultural values associated with it.

S

Sensitivity

The propensity of a socio-system or ecosystem to be affected (favourably or unfavourably) by climatic variations (and their physical consequences).

Examples of climatic variations: increase in average annual temperatures, decrease in the number of days with frost, etc.
Examples of physical consequences:
increase in droughts, decrease in river flows, rising sea levels, etc.

V

Vulnerability

The propensity of a socio-system or ecosystem to suffer damage, depending on its exposure, sensitivity and overall capacity to adapt to climatic variations (and their physical consequences).

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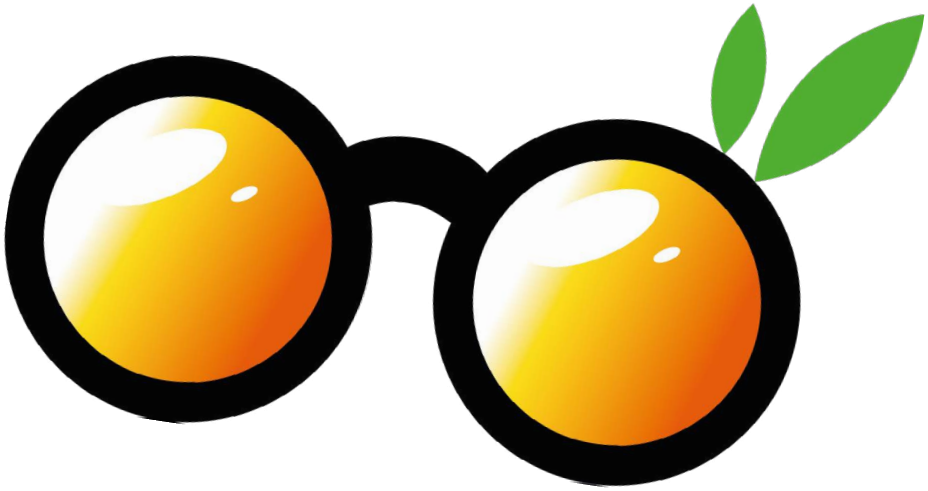

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